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EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

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EDITORIAL NOTES.

An Independent View of the Needs of the British Gas Industry.

GAS matters are, as a rule, very intelligently treated in the editorial columns of the "Builder," which is a great advantage to the constant readers of that admirable periodical. It is of a piece with this enlightened journalism that our contemporary should take prompt notice of recent events in the high politics of the gas industry, with which the name of Mr. Livesey has been prominently connected; and it is highly advantageous to the industry to have its fundamental principles discussed by so competent and impartial a critic. The "Builder" takes cognizance of the two salient features of the situation of the contemporary gas industry, which are —the announcement of the Welsbach Company that, come what may, incandescent mantles are going to be much cheaper; and the pronouncement of Mr. Livesey in favour of a considerably reduced illuminating power for the gas generally supplied for town's use. On the latter point, it is remarked that such a change would result in a largely-increased demand for gas, especially for cooking and heating purposes, which would redound greatly to the advantage of the community in general, "provided that the interests of "the consumers were efficiently guarded with respect to "the heating value of the gas." This is precisely the kind of observation that one might have looked for from the Gas Referees or from the London County Council; only, as it appears, these high authorities have no care for aught connected with gas beyond the standard burner. The critic goes on to observe that "for incandescent lighting the value "of gas appears to be mainly dependent upon flame tem-"perature; but for heating, cooking, and power purposes, "the calorific value is the main factor to be considered. It "has been repeatedly demonstrated that, generally speaking, "the calorific value of coal gas diminishes with its illumi-"nating power, and gas consumers should not consent to "any reduction in calorific value unless full compensation "be allowed therefor in the standard price." It is conceded that if something like 8 or 10 candle coal gas could be sold for 1s. 6d. per 1000 cubic feet in London, such a reduction in price would more than compensate for the reduced calorific value; "but the consumers should be protected by "the adoption of a heating-power standard." This is a very proper and sensible observation, which the most advanced gas engineers are quite prepared to discuss without prejudice.

It is obviously inexpedient that radical changes should be made in the character of a gas supply without precautions being taken to safeguard the interest of the public. Nor, so far as we are aware, has a claim to exemption from reasonable and proper testing of the product been preferred by anybody qualified to speak for the statutory gas industry of the United Kingdom. For the present, there is no legal substitute for the photometer as a test of the quality of gas; and it is doubtful if any alternative method of testing gas known to science could be safely accepted in its stead. All the talk about 8 or 10 candle gas needs to be understood in the true meaning of those who have uttered it, and subject to the fact, which remains, that nobody knows how to make a pure coal gas of such a character. Calorimeter tests are very attractive, and are deserving of much more respect than has hitherto been given to the study; but, in view of the disturbing factor recognized by the writer in the "Builder," these indications cannot be regarded as absolutely conclusive on the merits of a gas. We are all for liberty at this juncture, and in no sort of hurry to accept any new test for the new gas which the best technicians are only learning to make. We are not disposed to draw the line at carburetted water gas or anything else. Let it first be seen what sells best, and what can be made to the greatest advantage. That is the only way of progress, which can never be worked out by any other method than the laborious old rule known by the name of "trial and error."

In the meantime, we can reassure our friend of the "Builder" that if it is to be a case of legalizing the calorimetry of low illuminating power coal gas, the public will not suffer by any reduction of candle power within the reach of practical technics. While it is quite true, as he says, that the calorific value of coal gas diminishes with its illuminating power, this is far from being the whole truth. Cannel gas of 25-candle power is a much hotter fuel than 13-candle common coal gas, but not in proportion to the difference in illuminating power. Neither is the stronger fuel the easier and more convenient to burn. On the contrary, it is apt to be dirty, requires a great deal of oxygen, and is far more intractable than the lower-grade gas. Other considerations might be stated; but it is the notorious fact that when the highest grade of cannel gas was the standard gas of Scotland, the people scarcely knew what to do with it. Broadly speaking, the uses of a 13 or 14 candle power coal gas are far more numerous and easily compassed than anything which can be done with cannel gas, apart altogether from the question of comparative cost. Sinking the cost, it can be stated, without fear of contradiction, that if a town could to-day have the choice between 26 and 13 candle gas, it would be well advised to choose the latter.

The calorific power of such a coal gas as we have indicated as the most suitable, all round, for town supply may be taken at 600 B.T.U. per cubic foot. Professor Lewes states the calorific value of London 16-candle gas at 650 units. As at present instructed, we do not see how pure coal gas could be made of much less than the former figure; and it is perfectly safe to say that no English gas company need dread being put under compulsion to supply gas within a margin of 5 per cent. of this limit. But if the average, with the same margin, were put at 550 units per cubic foot, then no possible blend of coal and carburetted water gas which a British gas manager could ever find it an economical thing to make, would fail to satisfy the test. All this, of course, as we have already remarked, is strictly "without prejudice," and for the sake of an exchange of views. The question of testing for adulteration must follow the trade, not anticipate it. The safeguard of the public in this regard is that the calorific power of coal gas is a much more uniform and trustworthy characteristic than its illuminating power, be the latter high or low. It may be doubted if the calorific power of any make of gas in considerable bulk varies 3 per cent., one way or the other, for months together. Would that one could say the same of the pressure in the street mains! There is the chief disadvantage under which gas, as fuel, labours for the time being in most places. It is not much good discussing infinitesimal inequalities of calorific power, just as the gas examiners do their hundredths of a candle of illuminating power, while the main pressure is liable to alter by 100 per cent. and upwards. That is for the gas engineers to see to before they attend to anything else in this connection.

The Accounts of the London Gas Companies for the Past Year.

IN the present issue of the "JOURNAL," we give our customary statement of the collected accounts of the three Metropolitan Gas Companies; and we are relieved to know that, thanks to the year's parliamentary dealings with the Commercial Company, the next publication of the kind will once more stand on all-fours as regards the whole of the entries. It is still necessary to explain that the calculated averages in which the Companies' capital is dealt with are vitiated by the exceptional position of the Commercial Company's stock, which has not been converted. This exception will disappear from the next similar statement. Meanwhile, we have kept the form of this account stereotyped, in order that, apart from this disturbing element, the corresponding figures may offer a panoramic view of the development of the Metropolitan gas undertakings. The big figures are as impressive as ever. London, as supplied by the three Companies, paid £5,017,184 for its last year's gas sold by meter, and nearly £250,000 sterling for public

lighting. This is an enormous turnover for one necessary of town life. If a professed social statistician could satisfy himself as to the average ratio borne by this part of London's expenditure to the whole, it would form a datum from which to calculate how much the Metropolis spends every year to keep going.

The considerably increased gross rental of £290,017 was affected by the fact of reductions in price having been made for the latter part of the year. The heavy depreciation in residuals, of £263,108, nearly wiped out the gain in rental; the balance showing how narrowly the margin is cut in these times. The table giving the figures of the accounts worked out on the basis of the coal carbonization, including oil, are, as usual, the most eloquent as to the differences and similarities between the three undertakings. The Chartered have to earn dividend and interest on stock and loan capital amounting to £12 1s. 10·98d. per ton; while the South Metropolitan do their business with a burden for capital of only £6 5s. 8·84d. per ton. The Chartered take £1 11s. 0·42d. for the gas sold from a ton of coal; while the South Metropolitan receive £1 2s. 8·43d. for the same. The Commercial occupy an intermediate position. There has never been a satisfactory explanation of the fact that the South Metropolitan residuals bring in a bigger return—last year the difference amounted to 1s. a ton—than those of the Chartered, of which so much is worked up at Beckton. In the cost of carbonizing materials, the Chartered have the distinction of being a little higher than the year before; while the other Companies paid less. The item of salaries and wages for manufacturing is still strikingly unequal; and so also is the weight of the rates and taxes paid. It is truly remarkable that, although in our arrangement the cost of the South Metropolitan profit-sharing scheme is reckoned with the bad debts and extraordinary expenses, the burden per ton of coal under this line is not apparently increased. On this ground, it might be argued that the outlay in question costs the concern (comparatively) nothing. There is a very notable difference between the three Companies under the heading "Repair and renewal of meters and stoves, &c." Whereas the Chartered have a decrease of £34,917 here, the other Companies, according to their degree, had large increases. Those who are acquainted with the recent history of the undertakings will know what this means; and a sorrowful meaning it is.

The following table exhibits the carbonizing returns of the different Companies. The figures do not call for so much comment as in former years, when divergencies of judgment were understood to prevail as to the yield of gas that could be most profitably made from coal of similar character. Still, the South Metropolitan make is the smallest; and it is known to be the undiluted, unenriched product of the coals carbonized. It is something to have such a fixed datum, which knows nothing of the calculation of coal equivalents.

TABLE *showing the Residuals produced and Gas made per Ton of Coal and Cannel by the Metropolitan Gas Companies in the Year* 1901.

Name of Company.	Coke.	Breeze.	Tar.	Am. Liq.	Gas.
	Cwt.	Bushels.	Gallons.	Gallons.	Cub. Ft.
CHARTERED	12·30	3·85	9·87	29·40	9,938
COMMERCIAL	12·25	5·78	10·32	35·64	10,128
SOUTH METROPOLITAN .	12·36	5·63	9·13	32·37	9,882
Mean per Ton . .	12·32	4·61	9·75	30·85	9,929

Pending Coal Contracts.

THE friendly contest between the Metropolitan Gas Companies and the coalowners, over the question of the prices to be paid for the coal requirements of the former during the ensuing twelve months, has begun, and its upshot will be awaited with keen interest by gas managers throughout the country; for the terms upon which these requirements (amounting to about one-fourth of the total consumption of gas coal in the kingdom) are purchased has naturally a very material effect upon the price at which the smaller undertakings can make their contracts. The prices which have been paid under the contracts made last spring were, it will be remembered, far below the exorbitant rates which an unfortunate combination of circumstances enabled the colliery owners to exact in 1900; but they were, nevertheless, something like 40 per cent. above the lowest on record, so that a considerable margin exists for further reduction. Against granting any further reduction, however, the coalowners of the North of England are fighting their hardest; but we see no reason why they should be allowed to win.

It is useless for them to urge that, with wages at their present level, they cannot afford to sell coal at lower prices than those current; for buyers know full well that in the coal world wages follow prices, and that prices do not follow wages, whether the latter be regulated by scale or by arrangement. Again, the collieries cannot pretend that there exists a greater demand for coal than they can easily supply. The iron trade, it is true, is rather more active now than it was a year ago, in consequence of the extraordinary volume of business being done in the United States—where the demand for iron so far exceeds the supply that the German and British markets are being drawn upon. But the number of furnaces in blast is still well below the high-water level of two years ago. On the 31st of March this year, there were 343 furnaces producing iron, against 318 twelve months earlier; but the maximum number in blast during the recent "boom" was 430—and 87 furnaces represent an annual coal consumption of some 6 million tons, which is just about equal to the difference between the output of coal last year and that in 1900.

What has enabled the gas coal owners of the North to make the attempt to maintain last year's prices is, undoubtedly, the extraordinarily heavy shipments of coal to foreign countries and British possessions abroad. As will be seen from some figures published in another column relating to the trade of the March quarter, the total quantity of coal shipped for use out of this country during the first three months of the present year exceeded the exports in the same period of 1901 by 680,000 tons, and only fell short of the record (in the March quarter of 1900) by 100,000 tons. How much of this briskness of the export trade was due to the desire to anticipate the Budget, remains to be seen; but there is little likelihood of its being fully maintained in the coming months. The month of March, in fact, shows a falling off, compared with 1900, of nearly 400,000 tons, and an increase compared with last year of only 110,000 tons, against 570,000 tons increase in the first two months. But this lower rate of shipment in March is largely accounted for by the fact that Easter fell within that month this year, and did not do so in either of the two preceding years.

Another circumstance that has assisted in keeping the coal market from a severe fall is the diminished output, due to slack working by the miners, who are anxious to prevent prices from going lower if possible. Such a policy, however, if maintained for any length of time, and to such an extent as to achieve its object, could only result eventually in a worse fall in prices, through the damage done to trade by the artificially enhanced cost of coal. The coalowners, therefore, who do anything but discourage such tactics are playing with edged tools, which is notoriously dangerous. Reduced wages constitute the most potent cure for the miner's desire to idle; but the collieries within the Federation area are apparently shy of opening up that question, what time the Union is piling up its balance at the bank. That, however, is no reason why coal buyers should not do their utmost to force better terms out of the owners, whether by sending some of their orders farther North than usual, or by cutting down those orders to the smallest possible figure just now and buying more coal later on. Certainly, failing satisfactory bargains at the present moment, we should not hesitate to keep a considerable balance of "coal required" standing over for purchase at a more favourable season.

The Week in Parliament.

PARLIAMENTARY topics are not of a very exciting nature this week, the House of Commons having been occupied with revising the rules of procedure, which is always an interesting task for any organized body, but not equally attractive to outsiders. And yet the business of smartening up parliamentary routine is a very important affair for those who live under the British Constitution; for everybody comes within the scope of this procedure, at one time or another. The main question of the week in this regard has been the rights and opportunities of private members in respect of the promotion of legislation; and an enormous volume of superfluous talk has been poured out upon and around this subject, which, of course, in a theoretical way, comes close home to every member. Speaking for the gas industry, however, we have already had occasion to remark this session that if the passing of private members' Bills were much facilitated,

it would be a bad job for the great industrial and mercantile concerns of the country; for most of these measures are the outcome of pernicious fads.

The House itself, and the country at large, had an apt illustration of this view on Wednesday, when the Rating of Machinery Bill came up once more for second reading. Not to go into the merits of this measure for the present, it was impossible not to be struck with the conflicting and irreconcilable reasons advanced on behalf of the Bill by its supporters in the debate. It was a measure to relieve the industries of the nation from an intolerable burden; it was not to shift local rates. It made no alteration of the existing law; it was a much-needed reform of the law. Nobody would be a penny the worse for it; many would be immensely relieved. There would be no deficit in local rate funds; Government ought to grant subventions to make up for the remission of rating which the Bill would sanction. Some honourable members did not care whether the Bill passed or not; others set vast store by it. And so on, till the turn of the official spokesman for the Government. He, while leaving the Bill to the judgment of the House, gave a distinct warning that no help from the national taxation would be granted to make good any depleted rate fund. Then the House proceeded to read the Bill a second time; resigning itself to the knowledge that nothing more will be heard of it this year.

A Select Committee of the House of Commons is sitting to inquire into the question of the limitation of local authorities' loans to specified periods, which it has been alleged are too short for certain classes of loans. Evidence has been given as to the practice of the Local Government Board; it being stated that one general principle followed by the Board is to grant the maximum term only in the case of land purchase. Another guiding principle of the Board is that the period of the loan should not exceed the probable life and usefulness of the works; so that ratepayers of the future shall not be unduly burdened. The Board consider that a generation is as far as they can look ahead. It is admittedly difficult to fairly estimate the useful life of public works; but the experience of the Board apparently is that this is more often over than under estimated. It is plainly undesirable for local authorities' loans to be unrepresented by value. Another argument for the limitation of the period of such loans is the enormous growth of the local debt, which has increased 217 per cent. during the past twenty-five years. Representatives of all the Government Departments having dealings with these loans have been heard, most of whom spoke to the anxiety of the borrowers to get the longest possible periods for repayment. It was complained, on behalf of the Local Government Board, that when local authorities proceed by Bill in Parliament, they often obtain from the Committees easier terms of repayment than the Department would have allowed. It was also pointed out that, while it might be true that a large proportion of the local debt is for what are classified as remunerative undertakings, the return on some of these is very small indeed, while the commitment is large. Mr. J. Lithiby, the Assistant-Secretary to the Board in charge of the Local Acts and Loans branch, mentioned electric tramways and electric lighting as causes of loans which require to be kept well in check, by making it evident to the borrowers that the money will have to be repaid at short date. This witness suggested that before any further facilities for borrowing are provided, there ought to be some means of carefully testing the financial conditions of the borough or district. Twenty years ago, the Local Government Board expressed to Parliament the opinion that local indebtedness was materially increased by the terms on which the money could be obtained. The statement is of even stronger force to-day, and more specially applies to the modern fashion which approves of the postponement of the period for the repayment of loans, and also gives facilities for the repayment of interest out of borrowed money.

The Liability of Trade Unions for the Acts of their Servants.

On Tuesday last, the 8th inst., Mr. Justice Walton delivered at Cardiff his considered judgment in the case of *Giblan v. Labourers' Union and Others*, which has already been referred to in the "Journal" (*ante*, p. 822). It will be remembered that the plaintiff claimed damages against the defendants on the ground that they had unlawfully conspired to obtain his dismissal by sundry employers and to induce others not to employ him, and had also conspired to induce workmen to refuse to work with him. The Jury found that Williams, the General Secretary of the Union, and Toomey, who is the Local Secretary, had obtained the dismissal of Giblan, and had prevented his obtaining employment elsewhere, by calling out, or threatening to call out, the members of the Union; and that they did so, not at the instigation of those members, but on their own initiative. The damages were assessed at £100; but the Judge took time to consider whether the acts of the officials of the Union had rendered that body liable to damages. His decision is that Williams was acting *ultra vires*, and that therefore the Union is entitled to judgment in its favour; while judgment for £100 in favour of Giblan has been entered against Williams, the General Secretary.

This decision, which will doubtless be appealed against, rests upon a rather fine point—one that, if good in law, is not good in common sense or equity. Williams, holding the position of General Secretary to the Union, and possessing authority to exercise the full powers of the Executive Committee, used that position and authority to induce members of the Union to refuse to work with the plaintiff. But, in so doing, says Mr. Justice Walton, he exceeded his authority, because the purpose for which he induced the members to obtain Giblan's dismissal—namely, to punish him for not repaying the amount of his defalcations to the Union—was not one of the purposes for which the Union existed, and in the furtherance of which the Executive Committee were empowered to act. That being so, it may, as we have said, be good law that Williams was acting *ultra vires* (and an agent acting *ultra vires* does not commit the principal); but it is quite obvious that he was only able to do what he did—namely, to persuade other members of the Union to take a course they had not previously intended to take in regard to working with the plaintiff—by reason of his position and authority as Secretary of the Union. He went to the various works where Giblan was employed, and, as Secretary to the Union, threatened to call the men out if Giblan were not dismissed. He went to the men there employed, and, as Secretary to the Union, told them not to work with Giblan. But for his being the Secretary, the men would, in all probability, have refused to carry out his wishes; but for his official position, the employers would have told him to mind his own business. Yet the Union is held to be not liable for the injury done to Giblan.

Moreover, Mr. Justice Walton held that, while the action of Williams in inducing the men to refuse to work with the plaintiff was punishable, the action of the men in so refusing was not because Williams wished primarily to injure Giblan, while the men merely wished to bring pressure to bear upon him to induce him to pay what he owed to the Union. The one action, according to his Lordship, falls within the case of *Quinn v. Leathem*, the other within that of *Mogul Steamship Company v. M'Gregor* (*ante*, p. 202). This, while a material, is rather a fine distinction; and, if it be upheld on appeal, we foresee a considerable volume of litigation in the future over similar questions. It may, therefore, be well to quote Mr. Justice Walton's *dicta* thereon. After assuming that the Union was responsible for the acts of its co-defendants, and that therefore, through its agents, it prevented the plaintiff from obtaining employment, and after stating that the question to be considered was whether this concerted action, from which the plaintiff undoubtedly suffered damage, was an unlawful conspiracy, his Lordship said: "Having regard to the decision of the House of "Lords in the *Mogul Steamship Company v. M'Gregor* case, "I do not think this would be an actionable wrong if it were "done for the purpose of protecting or advancing the "interests of the members of the Union, as, for instance, "for the purpose of securing more work or better wages for "themselves, even though a necessary consequence of such "action would be to injure the plaintiff. On the other hand, "having regard to the decision of the House of Lords in "*Quinn v. Leathem*, I think it would be an actionable wrong "if it was done, not to advance the interests of the members "of the Union, except, perhaps, in some remote and indirect "way, but directly and primarily for the purpose of injuring "the plaintiff."

It appears to us, however, that this judgment fails to take into account one point apparently decided by *Quinn v. Leathem*—namely, that such action as that taken by some of the defendants in this case against Giblan is, if taken by two or more persons acting in concert, punishable as a conspiracy, unless done in contemplation or furtherance of a trade dispute between employer and employed, which certainly

did not exist, nor was contemplated, in this case. In view of this apparent conflict between the judgment now under consideration and that of the House of Lords in the case of *Quinn v. Leathem*, and in view of the by no means certain state of the law as laid down in the several judgments bearing upon the question of what does and what does not constitute actionable conspiracy, it is to be hoped that the decision of Mr. Justice Walton will be made the subject of an appeal.

The Waverley Association Meeting.

The venerable Waverley Association of Gas Managers—now in its forty-second year of existence—held their customary spring half-yearly meeting on Thursday at Kelso, which is also the cradle of the Association and the birthplace of all Associations of Gas Managers. Mr. Alex. C. Young, who since the year began gave up the managership at Kelso in order to assume similar duties in a larger sphere at Arbroath, returned to the scene of his former labours for the purpose of occupying the chair. Mr. Young is a member of only a few years' standing. It is interesting, in this connection, to observe that in the Waverley Association, the veteran has ceased even to lag upon the stage. The class is all but gone, so much so that last Thursday, notwithstanding that the Association has been on foot for more than the historic period of forty years, there was it is believed, with one exception, no one present who has seen a dozen years of membership. The exception was Mr. George Taylor, of Jedburgh, who long did yeoman service as Secretary of the Association, and who is still, it is a pleasure to be able to record, hale and hearty. If there were another exception to the observation, it was to be found in the person of Mr. A. Bell, of Dalkeith; but his membership—the active portion of it at least—is quite modern. There are older members still on the roll; but they are few, and they were unable to be present. The meeting had, consequently, an appearance of youth, which a stranger would not have looked for in so ancient a body. The reflection may be carried further. The gentlemen who are carrying forward the torch of knowledge in Sir Walter Scott's country, in matters relating to gas supply, have not only recently taken up the task, they are filled with the enthusiasm of youth; and thus the proceedings have an up-to-date smack which does not at all savour of the grandmotherly.

The Lighting of Kelso.

Mr. Young was able, when at Kelso, to push matters in connection with the lighting of the burgh so well forward that he is now justified in claiming that it is the best lighted town in the district. First of all the Gas Company secured the lighting, and then they improved it, bringing it up to the most modern pattern. The method of controlling the public lighting works very well in Kelso. It is doubtful if it would answer in many places, unless upon the condition which every gas company would not be prepared to accept—of the company being more generous than the shareholders might think warranted. Given the spirit of generosity, there need be no question that public lighting by gas companies would be popular; but, without it, one man in the town council who might have a suspicious mind, would upset the arrangement. It was right to have the matter discussed. At all events, Mr. Young was well advised, when he was framing his presidential address, to adopt a subject which he knew in practice. The discussion was more valuable in that it was a tangible subject. Mr. Young should feel gratified at the success of his meeting. The members who discussed his address did so in chatty fashion, but in a way which shows that they are fully alive to the problems of the hour, and are in accord with the more enlightened thought of the time.

A Curious Purchase Clause.

A purchase clause which is said to be unique was the basis of an arbitration held in London last week, in which Messrs. Newbigging and Valon were the Arbitrators and Mr. Ernest Moon, K.C., was the Umpire. The object of the proceedings was to determine the price to be paid by the Poulton Urban District Council for the undertaking of the local Gas Company, who are working under a Provisional Order. This Order limited the Company's capital to £12,000, with borrowing powers of one-fourth of the amount actually raised. The usual sliding-scale provisions were included; and the standard price was fixed at 5s. 10d. per 1000 cubic feet. A purchase clause was contained in the Order; and in 1900 the Council gave notice of their intention to exercise their right in this respect. As, however, the Local Government Board could not give powers with regard to two other townships embraced in the area of supply, it became necessary to promote a Bill. The result was the Poulton-le-Fylde Gas Act of last year, clause 5 of which says that the Council shall pay such consideration as will represent (*a*) the money expended by the Company on capital account in connection with the undertaking, together with (*b*) such additional sum of money as may be mutually agreed upon between the Company and the Council, or, in case of dispute, may be awarded by arbitration. The sum to be allowed as capital expenditure was agreed at £8208 4s. 4d., so that what the Arbitrators have to decide is the "additional sum" which the Council will have to pay. The latter portion of the clause in question certainly affords ample ground for argument by those learned in the law. For the Company, it was contended that there was a brilliant future before the undertaking, and that this should be taken into consideration. Mr. H. E. Jones's corrected valuation (including 10 per cent. for compulsory sale) amounted to about £34,100; while Mr. Robert Porter's figure was £33,110. For the Council, it was urged that valuation on a commercial basis was altogether precluded; and that no allowance should be made for goodwill, inasmuch as when the Company commenced operations under their Provisional Order, they entirely parted with their right to supply the district in perpetuity, and became mere licensees of the Local Authority. Messrs. E. H. Stevenson and Charles Gott were called on behalf of the Council; and they stated that, as £8200 was an agreed figure, the "additional sum" payable, if reckoned on a commercial basis, would be something over £4000. There is thus (as, indeed, is usual in such cases) a good deal at issue between the parties.

The Awakening of Darlington Gas Consumers.

There is no doubt that municipal trading has a very bad case; and almost daily there comes an addition to the already large accumulation of evidence in opposition. As a report in last week's issue of the "JOURNAL" shows, there are people in Darlington whose eyes have pierced the plausible but deceptive arguments of the municipal trader; and there is a probability that the whole question of whether the gas and water consumers should contribute as much as 10d. or 11d. in the pound towards the rates will be well agitated. Anyway, they are being stirred up to that end. Darlington is a glaring example of the fallacy of the municipal position. The question is there being put to the gas and water consumers in this form: Is it fair that you, who have paid back out of profits a large amount of the capital spent on the gas and water works should continue to hand over to the rates a sum equal to (say) 6 per cent. on the original amount of that capital, or (as one calculator puts it) 25 per cent. on the capital as it at present exists? The available figures as to the state of the capital stand thus: On the gas-works there has been expended £117,394; and on the water-works, £102,469—together £219,863. But out of the profits on the two undertakings, there has been repaid no less than £154,316—leaving the total liability under both heads at £65,547. Now, in face of the fact that the consumers have found the wherewithal to repay this large proportion of the principal, the Chairman of the Gas and Water Committee flippantly says that it is only right they should go on handing over to the rates an amount equal to an interest of 6 per cent. on the original capital. What, in perpetuity? The Chairman might find something illogical in his argument if applied to a business of his own, for the purchase of which he had raised a loan, and had repaid (say) two-thirds.

The Non-Consuming Ratepayer.

But, the Chairman may reply, "the analogy is not com-
"plete without regarding me as the ratepayers." Fallacy again. In his own business, the Chairman would have to provide out of his profits the money with which to repay the sum borrowed; but the ratepayers have not repaid the capital of the gas and water works out of the profits received by them. No; the gas and water consumers have had to provide not only those profits, but the money for the repayment of capital as well. And still they are expected to go on handing over to the rates 10d. or 11d. in the pound, or 6 per cent. on the entire amount of old and repaid capital!

It must be exceptionally galling to the open-eyed gas consumer—and to-day more than ever—to have to contribute such large profits to the rates. There are numerous ratepayers who do not spend a penny on gas; and yet in Darlington they receive the advantage of a substantial reduction in their rates from the pockets of the gas consumers! Why? No satisfactory answer has ever yet been given to this. The gas consumers, however, have had the point forcibly driven home by the following illustration: Messrs. Stephenson and Co. have erected large new works at Darlington, which will probably be rated at several thousands of pounds. They have had no part whatever in the past of the gas undertaking; and they are putting down their own electric light installation. This being so, it is fair to assume that they will never spend a penny with the Corporation for gas; but they will be relieved, from profits to which they will not contribute, of a substantial amount in the pound on the rates they will have to pay. Again it may be asked, Why?

A Novel "Gas Question."

Gas-works which are the property of nobody in particular are, unfortunately, not often to be found; but there appears to be at least one undertaking which up to now has occupied this curious position. The Dalton-in-Furness Gas-Works, though technically owned by the "property "owners, ratepayers, and gas consumers of Dalton Proper," are at present really the property of no one. They are managed by a Gas Committee of twelve members, who are elected by rotation. The works have never paid a dividend, and they have cost the town nothing; the price of gas being controlled by the necessary expenditure. The concern (which is valued at about £4000) is free from debt; and the price charged for gas is no more than 2s. 9d. per 1000 cubic feet. This strange state of affairs originated in 1852, when the Furness Railway Company bought a piece of town land for £700, and the Vestry decided to spend this money in providing, on the remainder of the land in question, gas-works for Dalton Proper. Everything has gone well up to the present time; but now, alas, further storage is needed, and there are no funds available for the purpose. This dilemma has resulted in the starting of a strong movement for the transfer of the works to the Urban District Council; and as the Committee cannot agree on the matter, it has been decided that they shall all retire (instead of three only, as usual) at the annual meeting later on this month, and so give the general public a chance of expressing their views. Whatever is done, the consumers can hardly expect to be much better off than they are with the present low price of gas; but from a financial point of view, it would seem desirable to have the District Council (and the rates) behind the undertaking.

Illuminants and Fire Insurance.

A carefully-worded little paragraph appeared in a London daily paper last week assuring users of electric light in this country that they need not be dismayed by the raising of fire insurance premiums in parts of the North American Continent, in consequence of what is called "fire "waste," the increase of which is attributed largely to the extensive employment of electricity for lighting and power. By the reading of the paragraph, it is pretty safe to predict that it was inspired by, or on behalf of, the electrical interests, who perhaps are more fearful that the increase of insurance premiums in North America will put the brake on the development of interior electrical work in this country than are the users of electricity that they will have to pay increased premiums. This is a fair assumption when one reads that the offices on this side of the Atlantic, having satisfied themselves by expert surveyors that the electrical installation is safe, make no extra charge; on the contrary, in some trades, the substitution of electricity for gas, or other illuminant, is followed by a reduction of premium—the risk of fire being considered less when the wires have been properly insulated. It is true that some of the fire insurance offices (we are not sure about all) make no extra charge where electricity is employed; but that certain of them regard the use of electricity as involving greater risk than gas is declared by the fact that special rules for wiring are prescribed. On the other hand, we know of no rules of a special character being applied by the insurance offices to gas-piping.

Reticence and Information.

The fire insurance companies are very reticent as to their experience with various illuminants; and we have no doubt, if they would speak, some of them could tell of considerable amounts having been paid out in connection with conflagrations which electricity was responsible for starting. We have a clear recollection, for example, of a large cotton factory away up North which was, last July, destroyed through the dropping of a wire. The damage then done was estimated at thousands of pounds. It is pretty safe to say this factory was not insured in the office of the Company who tell us, in regard to the relative danger of illuminants, that oil is undoubtedly considered the most hazardous, followed by gas; electricity being the best mode of lighting from a fire insurance point of view. This Company have evidently had a fortunate experience of electricity. But another Company evince a trace of anxiety when speaking of electricity. They inform us that, in the case of private houses, their charges would permit the premises being lighted by electric light "*fitted in accordance with our rules*," oil, or gas. In a great number of manufacturing or other risks of a special nature, however, an extra charge is made where the premises are lighted otherwise than by coal gas, "*approved*" electric light, or "*approved*" acetylene gas; but in no case would they allow the use of light by means of oil vapour "inside" any premises insured with them. It is a large and old-established Fire Insurance Company who gives us this information; and there is a plain indication here that they insist on special precautions in the case of electric light of a kind not insisted upon, or even suggested, in the case of coal gas. We find, as already said, a great unwillingness on the part of insurance companies to enlighten outsiders as to their observations respecting the relative risks of gas and electricity; but the fact that it is not considered necessary by a representative Company to enforce in the case of gas such measures for protection as are regarded as desirable in the case of electricity, is quite sufficient evidence as to which illuminant is marked by them as the most dangerous. Perhaps this Company have had something to convince them which the other one have not had.

Incoming and Outgoing Tenants.

Seeing that considerable interest has been aroused in the question of the legal relations existing between gas supply undertakings and consumers, by the historical articles on the subject which appeared in the "JOURNAL" last February (and to which appreciative reference has many times since been made by correspondents), we would call attention to the fact that another stage has been reached in the case of the *Gaslight and Coke Company v. Cannon Brewery Company*. We say "another stage," for we understand that the decision of the Judges of the King's Bench Division (who dismissed the Gas Company's appeal from the finding of Judge Edge, sitting at the Clerkenwell County Court) is to be appealed against. This, of course, precludes comment on the case at the present time; but it is to be noted that the Judges of the King's Bench decided against the Gas Company without even calling upon Counsel for the respondents. The Gaslight and Coke Company were involved in another case last week (at the Westminster County Court), which raised a somewhat similar point to the one above referred to. Here, however, it was a consumer who brought the action to recover a sum paid to the Company, under protest, on account of the preceding tenant's arrears. In this case, the plaintiff desired the continuance of the gas supply, and therefore Judge Woodfall experienced no difficulty in arriving at the conclusion that he was responsible, under section 18 of the Company's Act of 1872, for his predecessor's arrears. There is, of course, though both cases deal with the recovery of arrears from incoming tenants, a great difference between the two. The Cannon Brewery Company had not required the supply of gas to their premises to be continued; whereas in the second case the arrears were paid under protest, to prevent the Company cutting off the supply of gas—which they had sent men to do.

A Terrible Penalty.

Serious as is the crime of stealing gas by means of disconnecting the meter and joining up the service-pipe to that supplying the house-fittings, it is not one that is, according to the laws of the country, punishable by death; but Augustine O'Neill, an engine fitter, of Dublin, has had a higher law than ours to reckon with. Not only has he lost

his own life through having recourse to such wrongdoing, but the lives of his wife and child have also been sacrificed. It is true that at the inquest no positive evidence was adduced that the unhappy man actually fixed to the service-pipe the rubber tubing, which, by becoming disconnected, allowed gas to escape; but as the Gas Company did not do it, he must at any rate have had guilty knowledge of the matter. The details of this sad case are reported elsewhere; and a great deal of attention has been called to the affair in the local Press. It may, therefore, perhaps be hoped that the awful fate of the O'Neill family will act as a deterrent to those people who can only be prevented by fear of the physical consequences from committing a fraud for the purpose of saving a few shillings. Gas is a dangerous thing to meddle with; and this fact should at least be borne in mind by any persons who possibly would not, from moral considerations, hesitate to tamper with their fittings in a dishonest manner.

Gas Ousts Oil at Downham.

After four years' experience of oil lighting for the public thoroughfares of Downham Market, the District Council have decided to go back to gas. The adoption of oil was determined upon under circumstances which frequently arise in country towns—viz., disagreement with the Gas Company as to the price to be paid for the important service of illuminating the streets at night. In the period which has elapsed since the worthy councillors, possibly in a moment of pique, unanimously agreed to have nothing more to do with the Gas Company, they have had experience of the capabilities of their new servant, and also an opportunity of comparing them with those of a fresh comer in the form of the incandescent gas-burner, which the Company have lately introduced to their notice. As the introduction was accompanied by an offer to re-arrange the public lighting on the incandescent system on terms which a Special Committee considered so reasonable that they did not trouble to "figure the matter out," as the Americans say, the Council resolved to accept them. Downham has possibly, at the best of times, not an overwhelming trade; but under the depressing influence of oil lighting it has been falling off. It is to be hoped that the more brilliant illuminant which is to be employed will brighten the spirits of the population and give to business the stimulus which has of late been lacking.

WATER AFFAIRS.

Preparing for the Great Inquiry.

The Joint Committee of the two Houses of Parliament to whom has been referred the London Water Bill, held a preliminary meeting yesterday, and chose Lord Balfour of Burleigh to preside over their future deliberations; and in a few days the important inquiry entrusted to them will have been fairly entered upon. With more than seventy petitions to deal with, the Committee have a formidable task before them, even though the "prayers" of those presenting some of them may be, and possibly are, on very similar lines. Will they accomplish their task before the close of the session? Speculation on the point is useless now. It may safely be left till the Committee rise for the Whitsuntide recess, when the progress made may allow of a forecast for the future. Mr. Long is hopeful. Speaking to the members of the South London Joint Conservative Association at Newington last Wednesday, he said the only danger with which the Bill was confronted was that of time. He confessed that he was not in the least afraid that any opposition would be offered to it sufficiently serious to jeopardize its progress through Parliament. This may be so; but it will be strong enough to impede it. The interests concerned are so numerous and so important, that much time must, of necessity, be consumed in dealing with them and with the claims put forward for their representation upon the proposed Water Board. The up-river authorities have taken a very definite step in this matter; and it will be seen, by a report which appears in another column, that a movement has been initiated in Kent for preventing the abstraction of water from the chalk strata of that county for the supply of London. The object is to secure Kent water for Kent people, and an attempt may possibly be made to attain it by means of the London Water Bill. But supposing it is not, there will still be an abundance of work for the Committee to dispose of.

Though the matter referred to in the preceding paragraph more immediately concerns one of the London Water Companies, the question involved—that of the effect of pumping operations in depleting streams—is part of the larger one dealt with by the Bill introduced by Mr. Abel Smith, noticed last week, which still awaits second reading; and it is one upon which legislation is called for from several quarters. This was clearly shown by the remarks elicited by the paper submitted to the Conference on Water Supplies and River Pollution last October by Mr. Clayton Beadle, who, as a resident in the district supplied by the Kent Water Company, was one of the speakers at the meeting reported elsewhere. The burden of the story told in his paper was that the flow of the Cray has been very steadily decreasing ever since the Company began pumping at Orpington and Crayford; while Lord Avebury declared the other day that the springs in the locality had never been lower than they are now. This certainly looks, at first glance, like cause and effect; and Mr. Beadle evidently so regarded it. Lord Avebury, however, was more cautious, and declined to discuss how far the shortage of water complained of might be due to the deficient rainfall of the last few years. If water is now scarce in Kent, it may arise from causes which have brought about similar conditions in other districts where no pumping work has been going on. Moreover, the Water Company are not the only people who draw upon the supplies of water in the chalk strata in the county. There are several private pumping-stations which lift an enormous quantity every day. Why, then, as Mr. Whitaker very pertinently asked at the Conference alluded to, should the public water supply get the credit—or rather the discredit—of doing all the damage? Complaint is made that the water is being taken for the use of London. Granted; but, as Mr. Whitaker was careful to point out, when it is a question of supplying the population of a huge town or conserving the water for a few mills in the hands of private companies, the necessities of the many should have prior consideration to the requirements of the few. This may, of course, be the view taken of the matter by the Committee on the London Water Bill, should they ever be called upon to deal with it.

Water-Rent or Water-Rate.

That there is at least a technical distinction between a water-rate and a water-rent was demonstrated last week in a case decided at the Leeds West-Riding Police Court, when eighteen residents of the Crossgates district were summoned, at the instance of the Tadcaster Rural District Council, for non-payment of water-rates. The defendants contended that the supply had been insufficient, which was the reason of their refusal to pay. But, on behalf of the Council, it was urged that this was no defence to the non-payment of a water-rate, as the ratepayers had their remedy in an appeal to the Local Government Board. Then the defendants submitted that it was not a water-rate, but a water-rent, in respect of which they had been summoned. According to the Council's own demand-note, defendants were summoned for water-rent in advance; and at the date the summonses were issued, there was not a penny due. The time had therefore not arrived when the Council could recover. The Bench agreed with this view, and dismissed all the summonses, after having declined to allow them to be amended. Doubtless the matter will be heard of again, and then the cases will have to be decided on their merits. But we may be assured that, in taking similar proceedings in future, the Council will not fall into the serious error of demanding payment of water-rent in advance, and then summoning defaulters for the recovery of water-rate.

A Disclaimer.—Several times of late the suggestion has been made—twice certainly last week—that Bailie M'Kelvie who, as a Leith Town Councillor and a member of the Gas Commission, has been identified with motions to a considerable extent inimical to the actions of the majority of the Commission and their Engineer, is connected with a firm that has been for many years engaged in the gas coal business. It seems, therefore, appropriate (in justice to all the parties alluded to) to publish a disclaimer that Bailie M'Kelvie is not, nor is he in any way related to, Mr. James M'Kelvie, of gas-coal and cannel fame; neither has he any connection whatever with the firm of Messrs. James M'Kelvie and Co., of Haymarket, Edinburgh.

ESSAYS AND REVIEWS.

INSTITUTION OF GAS ENGINEERS.

The Annual Meeting.

To-day the formal notice and programme of the annual meeting of the Institution of Gas Engineers will be issued to the members; and we have confidence that their preliminary verdict will be that the Council have succeeded in composing for them an *agenda* as attractive as any they have had in recent years. The dates of meeting are April 30 and May 1 (Wednesday and Thursday), with an excursion on May 2. As customary, the business and technical part of the proceedings will be conducted in the Theatre of the Institution of Civil Engineers. On the first morning, after the opening business has been disposed of, Mr. Thomas Holgate, of Halifax, will succeed Mr. W. R. Herring in the presidential chair. Following the presentation of the report of the Council and the statement of accounts, will come a discussion on that now "hardy annual"—the amalgamation question; and after the position it was left in last year, the result of the deliberations this year will be awaited with peculiar interest. The next item of importance will be the President's address; and throughout Mr. Holgate's composition we expect to find much of the fruit of his *penchant* for investigation. This will complete what may be termed the first part of the programme.

Coming to the second section (which will occupy the remainder of the Wednesday's meeting and the whole of Thursday's), the name appended to the title of the first paper causes us to halt in our writing. The name is that of the late Mr. Bryan Donkin; and this paper sets the seal to the record of the long and studious life which he devoted to the cause of science, and in particular to the gas industry. It contains no doubt his last written words on a subject which to say that he loved is not an exaggeration. It is "The Heat Efficiencies of Gas, Oil, and Steam Engines." The fact that the hand of the master who wrote the paper is now at rest for ever, will give to it a solemn as well as a technical interest. "A Talk on the Development of the Gasholder" by Mr. George Livesey will follow; and as it is long since we have heard Mr. Livesey devote himself exclusively to the subject of gasholders, in which line of engineering construction he has won for himself great fame, the members may look for something of more than ordinary interest. A good current topic is promised by Mr. H. E. Jones in his contribution to the subject of "The Illuminating Power of the Gas of the Future." The author's recent study of this question for parliamentary purposes will enable him to present to the members an excellent case for low-power gas. Mr. Jones and others have convinced Parliament that high illuminating power gas is not the gas for the future; and it will be interesting to see how gas engineers from various parts of the country will view the question. It is certainly one which throws open the door to a big discussion. Succeeding Mr. Jones, Mr. W. R. Herring will appeal to the members to appoint a Committee for the purpose of bringing about "The Unification of the Methods of Stating the Items Comprising the Carbonizing Costs in Gas-Works." Several gas engineers have already given their approval to the proposal; and it is heartily hoped that Mr. Herring will be successful in his undertaking. London shows up well with its contributions to the *agenda*. A theory is to be propounded by Mr. A. F. Browne, of Vauxhall, in connection with the subject of "Coal Gas Condensation." Mr. J. F. Smith will appropriately succeed him with a paper on the subject of "The Solubility of Naphthalene."

This finishes the technical list. In addition, there will be the annual dinner at the Hotel Cecil on Wednesday evening; and on Friday, the members will visit Cambridge. In the morning, there is to be an inspection of the gas-works, where the Engineer (Mr. Richard Brown) has plenty of new plant to show. It may be mentioned that Mr. Brown has modernized the plant throughout during the time he has been at Cambridge; and the visitors will see at work his inclined retort installation and coal plant, and the coke conveyor in course of construction. Among other fresh introductions to the works will be found condensers, engine-house and exhausters, and purifiers. The afternoon will be spent in visiting some of the colleges, and other places of interest. Given fine weather, the day's outing promises to be one of enjoyment and interest.

PRACTICAL HEATING VALUE OF FUEL GASES.

The article which Mr. Thomas Fletcher has communicated to this week's "Journal" (see p. 955), deserves the most serious attention of all who are in any way interested in the application of gaseous fuel to heating purposes on a small or moderate scale. The article excludes from consideration the larger industrial uses of producer gas and similar gases, because the capabilities of these gases in this direction are well proved and known. No one at the present day questions the fact that retort-furnaces can be fired economically and satisfactorily by producer gas; but it must not be forgotten that, apart from some system of recuperation—crude though it may be regarded—the economy of gaseous firing, so far as fuel consumption alone is concerned, is none too well authenticated.

In the retort-house, as in other industrial fields in which the gas-producer has established its pre-eminence, its success must be attributed rather to the collateral advantages which it offers—such as facility of application of the principle of recuperation, the possibility of directly heating a substance without contaminating it with the ash or other component particles of solid fuel, &c.—than to any direct economy of fuel. But where such collateral advantages are of no avail, gaseous fuel cannot hope to supersede solid fuel, unless it is obtainable as a bye-product at a price which is lower than that of the coal or coke expended in its production. Thus blast-furnace gas may be economically employed for heating boilers in places where it is obtainable; whereas it is not economical, as Mr. Fletcher points out on the authority of Mr. Dowson, to employ producer gas, made for the purpose, for boiler firing. It is necessary to bear in mind, in every comparison of the merits of solid and gaseous fuel, that there is a certain loss of heat in the process of gasification—amounting, in the case of ordinary producers, to about one-fourth of the heating value of the coke consumed in the producer; and this loss has to be made up through the better utilization of the heating power of the gaseous fuel, before any economy can be claimed for the latter. In some cases—such as boiler heating—it is almost impossible to secure better utilization of the gaseous fuel to the extent required to bring it on even terms with solid fuel used directly. Nevertheless, there remains such a wide scope for the profitable employment of gaseous fuel on the large scale, quite apart from its use for generating power in internal combustion motors, that it becomes a most serious question for manufacturers and the community at large what is the type of gaseous fuel which will most economically meet their requirements. On this point, Mr. Fletcher becomes highly suggestive, and we believe instructive, though he puts forward his fundamental statements in so tentative a manner that we fear they will not carry absolute conviction to his readers. Hence it seems desirable that we should endeavour to indicate the true bearing of his article as we conceive it.

There has been a marked tendency of late to advocate the valuation of gas for domestic and general use according to its calorific power, now that valuation according to illuminating power has become discredited. The advocates of this method of valuation argue broadly that, since gas is now so largely consumed for the development of heat (even though the ulterior object be the development of light or the generation of power), the cheapest gas supply for the consumer is that which affords him a given number of units of heat at the lowest cost. Some twenty years ago, when the sway of the photometer as a gas assessor was undisputed, it was commonly argued that the gas which afforded a given number of statutory candle-hours at the lowest cost was the cheapest supply for the consumer. We have learnt the fallacy of this argument, as applied to present-day conditions of gas consumption; and Mr. Fletcher would have us reflect ere we exalt the calorimeter to the position held even now by the photometer. We hope to publish shortly an article which essays to deal with this threatening apotheosis of the gas-calorimeter in a more exhaustive and authoritative manner, though unable to endorse in its entirety the attitude adopted by its writer.

Meantime, let us see on what grounds Mr. Fletcher is unable to accept the prevalent idea that the consumer is equally well served with gas of high or low calorific power, provided the price to him varies in direct proportion with the calorific power. For example, is coal gas having a calorific power of (say) 160 units per cubic foot, if obtainable at 2s. per 1000 cubic feet, more or less economical for heating purposes to the consumer than a fuel gas having a calorific power of 40 units at 6d. per 1000 cubic feet? This is the question Mr. Fletcher asks—with the reservation that only domestic and the smaller industrial requirements shall be considered. The answer he seems to suggest is that 2d. to 3d. would more nearly represent the relative value of fuel gas of that calorific power than the proportional price of 6d. Let us look for a moment at the reasons for such an answer.

Mr. Fletcher mentions first a rough test, in which, under like conditions, $3\frac{1}{2}$ cubic feet of 18-candle (coal) gas heated an iron plate to 600° Fahr.; while 35 cubic feet of Dowson gas were required to give the same result. In other words, ten times as much Dowson gas was needed as coal gas. Next, he mentions that, with a blowpipe with carefully adjusted air supply, 6 cubic feet of Dowson gas were required to melt a thin rod of cast iron, which rod could be melted with $\frac{5}{8}$ cubic foot of coal gas. That is to say, about seven times as much Dowson gas was required as coal gas. In this second example, the very important factor of time is mentioned. The Dowson gas occupied 2 minutes, and the coal gas only 50 seconds to melt the rod. The third and last experiment, in which gas consumption is stated, is that a gas-fire with a consumption of six times as much Dowson gas as coal gas gave "a fairly cheerful-looking fire, duller in appearance than with coal gas, but rather more powerful as regards radiant heat." In all these cases, doubtless Mr. Fletcher has preserved a record of the precise conditions. It is not, in our opinion, sufficient for the purpose of elucidating the reason of the undue inferiority of Dowson gas, which is here displayed, to know that the trials were made under identical conditions for the two types of gas. The conditions must be exactly recorded; so that no factor which may have influenced the relative consumptions of the two types may ultimately escape detection. For instance, we should be surprised if the ratio of coal gas to Dowson gas consumed were the same, if the cast-iron rod which was melted were $\frac{1}{16}$ inch thick as if it were (say) $\frac{7}{16}$ inch. The cooling influence

of the two rods upon the flame would not be the same; and we should anticipate a consequent effect on both the relative consumption of, and the relative times occupied by, the two gases. Unsuspected influences may thus, by a process of gradual elimination, be revealed. But let us return from this digression, on the importance of fully recording experimental conditions in all research work, to Mr. Fletcher's comparative trials.

The three examples, though we must feel that they should be supplemented by many more, suffice to draw attention to the inconsistency—real or apparent—in the relative duties of the two types of gas. Dowson gas should have a calorific power between one-fourth and one-fifth that of coal gas; and hence a consumption of (say) 4½ times as much Dowson gas as coal gas might at first sight be expected to perform the same duty for heating purposes. Instead, Mr. Fletcher reports that from six to ten times as much Dowson gas was required in the examples quoted. It may here be parenthetically remarked that he does not question that, in particular cases, the heating duty obtainable from the two gases corresponds exactly with their calorific values. But he implies that these cases are either those of large industrial installations, where the poorer gas is cossetted by a supply of preheated air and insulating walls, and is so urged to develop its utmost heating duty, or those in which heating of low degree only is needed. The first of these two classes of installations he does not deal with further, because he thinks that recuperative and insulating devices are too complex and expensive for inclusion in the smaller installations of heating apparatus such as is required for domestic and small industrial uses. Actually, it will be hard to draw a line of demarcation between installations in which recuperative devices—ranging from the simplest to the most complex, and from the least to the most highly efficient—will be remunerative, and those in which they will not.

The second of the two classes of installations must necessarily have only a limited application, as low-degree heat is in but restricted demand, and industrially is generally obtainable from the sensible heat of flue gases or from exhaust steam. Nevertheless, it is well to remember that, for certain purposes—*e.g.*, warming water or air—the poorest fuel gas can be made to return a duty of virtually 100 per cent. of its theoretical heating power. The apparatus for the purpose must be somewhat elaborate in structure, but not necessarily so much so as to preclude its application for general use. Thus bath-water heaters of the type designed many years ago by Mr. A. Vernon Harcourt, and now, in slightly modified forms, in fairly extensive use (especially on the Continent), by ensuring complete combustion of the gas, and by applying to the full extent the system of reverse currents, utilize the whole of the heating power of the gas. They may be thus actually employed as calorimeters for determining the heating power. But the use of gas for heating purposes is by no means confined to warming a stream of water for baths, &c.; and hence Mr. Fletcher considers only other domestic and small industrial applications in which the duty obtained must in any case fall far short of the theoretical heating duty of the gas. The essence of his inquiry is this: Whether in the generality of such applications the falling away from the theoretical heating duty is not far greater with fuel gases of the Dowson and Mond class than with ordinary coal gas. Further, if this is proved to be the case, has the fact been recognized in past discussions of the relative merits of these fuel gases and coal gas for heating purposes in houses and small factories?

We have endeavoured, under risk of a charge of great discursiveness, to indicate the real issue of the inquiry which Mr. Fletcher's article prompts gas manufacturers and consumers to make, and the great economic importance which attaches to it. It is, as Mr. Fletcher suggests, desirable that the inquiry should be conducted, as far as may be by those who have no *ex parte* interest in its upshot, but who have adequate technical knowledge of the points involved in it.

It must be admitted that, in the first place, Mr. Fletcher's case against Dowson and similar fuel gases is at present none too well substantiated; and, in the second place, that the apparent anomalies in the duties realized in the instances quoted are not wholly inexplicable, and do not necessarily entail a general condemnation of the use of the fuel gas for the purposes in question. On the first point, it rests with Mr. Fletcher and other experimentalists, who have at hand both supplies of coal gas and Dowson or Mond gas, and the necessary means of conducting reliable trials, to substantiate his deductions by a greater mass of experimental evidence. On the second point, it seems to us that the apparent anomalies are to be attributed to the fact that Dowson gas gives a flame of very much lower temperature than the flame of coal gas. Hence, it is less well adapted to securing high temperature effects. We are not quite sure that Mr. Fletcher fully appreciates this difference. Probably there are no actual determinations of the temperatures of the flames of the two gases which are comparable and applicable; but the temperatures which would result in each case, did not dissociation of the products of combustion take place somewhere above 2000° C., can be approximately computed, and show a superiority of about 600° C. to the coal-gas flame.

Now, although, owing to the aforesaid dissociation effects, this superiority is not realized to an appreciable extent in the flames when they are preserved from cooling influences, yet when the flame is brought in contact with a surface much below the normal temperature of the flame, the superiority of the coal gas—as represented by the 600° C. named above—would certainly be made apparent, in that the falling off from normal temperature would, in virtue of the 600° C. of reserve, be less in the case of coal gas, or would perhaps even be wholly prevented. Thus, while there is reasonable ground for thinking that the same maximum temperature of about 2000° C., attainable by combustion, may be reached in the flame of either coal gas or Dowson gas, yet slight cooling influences will almost at once have a directly proportional reducing effect on the temperature of the Dowson-gas flame, while scarcely if at all affecting that of the coal-gas flame, because, but for the dissociation of the products of combustion at about 2000° C., the latter flame might attain a much higher temperature.

The line of argument we have here taken is certainly open to damaging criticism. Nevertheless, it is clear that the greater possibilities of coal gas in the direction of maintaining a high flame-temperature under cooling influences give it a great advantage for many uses over most fuel gases, quite apart from its higher calorific power. This advantage has a twofold effect. The maintenance of the high temperature of the flame is good directly, as aiding the rapid heating of the cooling medium; it is likewise very beneficial indirectly in ensuring that the combustion of the gas is more nearly perfect than it would be if the temperature of the flame were lower. Thus, when the flame is subjected to cooling influences, the greater reduction of temperature which occurs with the Dowson gas flame renders the proportion of gas which escapes complete combustion greater, and so the combustion of the gas does not develop its full calorific power. We assume that this is actually the case from the foregoing theoretical consideration; but experimental proof is wanted. It has been shown in the case of atmospheric coal-gas flames that when a kettle filled with water is being heated, the proportion of incompletely burnt gases in the products of combustion is small. We believe that Mr. Fletcher, Professor V. B. Lewes, and others, have demonstrated this; but the most recent and exhaustive set of researches on the point is probably that of Drs. Haber and Weber, reported in the "JOURNAL" (Vol. LXVII., pp. 510, 562, 622). What is now wanted, as Mr. Fletcher indicates, is a similar set of researches on the products of combustion of a typical fuel gas, such as Dowson gas, when the flame is playing on a kettle or similar vessel. We suspect that the proportion of incompletely burnt gases in the products would be quite appreciable—*i.e.*, very much higher than in the case of coal gas. If so, then Mr. Fletcher's contention that the gas of lower calorific power is more than proportionately inferior for most domestic heating purposes would be conclusively proved. But the proof suggested here is still wanting.

Mr. Fletcher refers to the admixture of water gas with coal gas, and asks whether this admixture may not tend to increase the proportion of incompletely burnt gases in the products of combustion when the flame is subjected to cooling influences. There is no ground for supposing that this would be the case; since water gas, unlike Dowson gas or similar fuel gases, presents at least as great a possibility as coal gas of maintaining the maximum temperature obtainable by combustion, even under cooling influences. Water gas, either simple or carburetted, stands on quite a different footing from Dowson gas, Mond gas, producer gas, &c., in this respect. Yet another set of researches, like those of Drs. Haber and Weber on coal gas, is needed to determine the proportion of incompletely burnt gases in the products of combustion of water gas in cooled flames, &c. The results would be invaluable in determining the practical utility for domestic heating purposes of the mixed coal and water gas supplies which are now common in many towns.

This question, however, should be made subsidiary for the present to the more important one of determining the relative practical values for domestic heating and small industrial uses of coal gas and fuel gas such as Mond gas—to instance the type of fuel gas which has received great prominence of late. Mr. Fletcher is undoubtedly right in assuming that, in many such uses, the employment of recuperative devices and insulating material is all but impracticable; and there is no question that, in the absence of these, fuel gas renders a relatively low duty. But we want more definite information on the point, in order that fuel gas schemes which may be brought forward in the future may be discussed strictly on their merits. The consumer for larger industrial purposes may be trusted to take care of himself; but the multitude of smaller industrialists need helpful guidance.

Finally, it should be pointed out that apparatus for the consumption of fuel gas for different purposes has not reached the same high degree of perfection as similar apparatus for the consumption of coal gas. Hence, at present, comparative trials are likely to give results somewhat more favourable to coal gas than correspond to the true merits of the two types of gas. With this caution, we heartily commend Mr. Fletcher's communication to the earnest consideration of our readers.

The Late Sir Andrew Clarke.—At the last monthly meeting of the Liverpool Corporation Water Committee, Alderman Burgess alluded to the death of Sir Andrew Clarke, who, he said, was the first honorary Freeman of Liverpool. This honour was conferred on him on account of services rendered to the water undertaking of the city—especially with regard to his careful survey of the masonry at Vyrnwy. He rendered most valuable service to the Corporation in this respect. Alderman Grindley observed that he remembered the time when Sir Andrew's services were brought into requisition at Vyrnwy. The verdict of all was that nothing but an earthquake could disturb the dam as constructed.

WANTED—A FREE HAND FOR THE GAS MANUFACTURER.

The French Government are doing everything in their power to encourage the use of alcohol in the Arts and Industries, because it is a native product. The British law until recently absolutely barred the employment of mechanically propelled vehicles (other than steam rollers and traction engines) on the highways. In these two statements one can perceive the difference between British and Continental notions of the nature of the relations that should subsist between a government and a national industry. It is a hoary complaint of British merchant adventurers, inventors, and travellers with an eye to the good of their country, that no Government is so indifferent as the British to the interests of those who might reasonably look to its agents for guidance, information, or even common civility. It is the same at home as abroad; and now that we have gone in for Municipalism at home, what the National Government cannot do in the way of discouraging and stifling individual enterprise, the local authorities try to accomplish. But do not let us be misunderstood. We would not ask a British Government to "protect" British enterprise and industry, as the obligation is understood by almost every other national government in the world. To coddle over-much is also to cripple. There is, however, such a thing as giving a fair field and no favour to a promising industrial development; and this the British Government and British Municipalities do not always afford, where pre-conceived notions and the powers of officialism are antagonized.

Of course, the British home industries want more educated men to work them, and more scientific gentlemen to lead them, and more endowed laboratories to find out all about their methods and discover better ways. As to these requirements, we are all agreed. But it is not less true that what British pioneers want even more is a freer hand to try things. This very old country is so governed and regulated, that what with the policeman at the corner and the local government official in his office, it is extremely difficult, as the late Mr. Mundella observed, to try an experiment in many departments of national activity in which procedure has run into ruts. At the present time, when the fashion of municipal trading is being followed in regard to so many public supply services, as constituting "progress" in itself, it is well to raise the protest that the gains of municipalization, whatever they are, can only be secured at the price of the extinction of initiative. Only that service is ripe for municipalizing in regard to which there is admittedly no opening for any important improvement which might involve the sacrifice of plant thereby rendered obsolete. Necessarily so; because no outlay of public money is justifiable where there is any real risk of its becoming locked up in something which is superseded. The administrators of such undertakings are bound to be antagonistic to innovation beyond a very limited range. Consequently, their agents and managers are constrained to acquiesce in routine methods, and to practise husbandry to the exclusion of enterprise.

This is a very grave state of things for any human art to be subjected to, and for any human intelligence to submit to, for any immediate gain. Hitherto, initiative and enterprise have been the distinguishing characteristics of British industry. Beginning in experiment at home, British enterprise carried railways, and gas supply, and steam navigation, throughout the world. It is no mere coincidence that, *pari passu* with the home municipalization of some of these undertakings and their analogues, the van of their development in the wide world should be taken by foreigners. The free, unofficial Englishman is the boldest of pioneers; but the mere English functionary is among the timidest of mankind. The enormous modern increase of British bureaucracy under the system of local government, and its extension over much that was formerly left to individual effort, constitute a national danger. We are, as a nation, everywhere being shut up in official straight-jackets, for fear lest in our manufacturing energy we should hit somebody. One industry after another is officially catalogued as dangerous, and placed under restraint; and it is far more popular to shut up a growing enterprise (as gas supply) in municipal bondage, than to give it its head and let it show what it can do for the public at large.

So it has come to pass that even bureaucratic France can show us an example of encouragement of a nascent industry. "The French Government are leaving no stone unturned to further the use of alcohol for motor-car purposes. An elaborate series of speed tests of vehicles operated by alcohol engines is to take place in France early in May. . . . The Minister of Agriculture is offering a cup for the winner." So runs the report which has been going the round of the newspapers. We hope our gas engineering readers are taking a benevolent interest in the development of automobiles. The motors, it should be remembered, are almost exclusively gas-engines; and the mechanical triumphs which are being won in the face of many difficulties in the perfection of these small motors are likely to go far beyond the immediate application. It is not necessary to admire all that enters into the present "fancy" for automobilism in order to accept it as a growth of mechanical science charged with great potentialities of good service. In due time the extravagant and unlovely features of the present experimental period of this new branch of mechanics will disappear, and civilization will find itself in possession of a new resource.

The best that English Governments, national and municipal, can do for a native industry is to let it alone. Unfortunately, this is precisely what is not done in regard to so important an industry as that of gas supply. Although, notoriously, British gas is passing through a crisis of its fortunes, and a transition stage in its internal economy, the cry is being raised for more regulation, more inspection, more tying up with red tape. The Home Office is to be implored to take action in restriction of the manufacture of carburetted water gas, at the instance of the Liverpool Corporation traders in electricity, who would gladly assist at the cutting up of the Liverpool United Gas Company's dead body. It annoys the Liverpool Corporation that the Company persist in living and growing, in their despite, notwithstanding all the prophesying of all the electrical professors who have pronounced the doom of gas. Not being able to give effect to these prophecies in another way, the trade rivals of the Liverpool Gas Company are bent upon setting the Home Office in motion, as they fondly imagine, to the embarrassment of the Company. We saw what happened the other day to the Commercial Gas Company, who, although unmolested by the local elective governing bodies in their district, had to run the gauntlet of the London County Council opposition, mainly because the official eye cannot, or will not, read the signs of the times.

It is possible to paraphrase the utterance of a great Frenchman, and say of all these vexatious proceedings against gas companies, "Officialism is the enemy!" In the case of Liverpool, there is more than one enemy. But here the Gas Company are not proposing to do anything other than fulfil their statutory obligations; and the Local Authority are bent upon harassing them on this account, if possible. The Commercial Company wished to make a change in their obligations towards the public; but the official opposition, while not able to resist the change upon the merits, tried to rob it of all its advantages by a flank onslaught. It can only be the robustness of the constitution of the gas industry which enables it to resist such insidious and persistent attacks, which come now on one side, now on the other. Neither high nor low candle power of the gas secures immunity from these antagonisms, as the present examples show. Yet the gas industry, as such, would certainly not find salvation by becoming municipalized everywhere. Electricity supply in the United Kingdom, having been dedicated from its statutory beginnings to this method of upbringing, has not conspicuously justified the principle, and electricity generation, after all, is a much simpler manufacturing industry than that of gas.

The late Lord Melbourne—Prime Minister of England in days before the rise of the Manchester school of statesmanship—was accustomed to ask, when anybody urged him to put the Government finger into some particular pie, "Why can't you let it alone?" and it was accounted to him for wisdom. A good deal of water has run under the bridges since a "masterly inactivity" was esteemed the highest statesmanship; and now we live in an age of widely extended Government regulation and inspection of things industrial. As regards the contemporary gas industry, however, we do raise the plea that it may, just at the present juncture, be left alone as completely as possible. Things are in a critical and transition state in this great national industry, as we have already shown; and it is devoutly to be wished that the heavy hand of the official inspector and examiner should respect, so far as is possible, the tender beginnings of the new order which seems to be opening out before the industry. The typical official is always behind the times. Never being called upon to originate anything himself, he is naturally to be found in the opposite camp, of those who suspect all innovators of being enemies of the human race, and pestilent fellows, who ought to be suppressed. Low-grade gas is being brought into the world; and we must not let the official element, which naturally holds to the established order, strangle it in its cradle, just because it is something apparently new.

COMPULSORY ARBITRATION IN TRADE DISPUTES.

(*Continued from p.* 878.)

One of the most striking facts in regard to the working of the Industrial, Conciliation, and Arbitration Laws of New Zealand is that in only one case has an employer asked that a difference between him and his men should be adjudicated upon by a Board or the Court. That one fact, and the statement and admission made by one of the most ardent supporters of the principle of compulsory arbitration—that "the Trades Unions are enthusiastic believers in the Act, rather too enthusiastic indeed, for they have shown a tendency to make too frequent a use of it"—of themselves provide sufficient proof of the one-sided and unjust operation of the laws. Disputes are much more frequent than formerly. The professional agitator "makes it his business to see that the Boards have plenty to do, and frequently appears where relations are satisfactory, and takes care that advantage is taken of the provisions of the Act." Moreover, the professional stirrer-up of strife not infrequently gets elected by the Trade Unions as a member of a Board of Conciliation (or, as someone has called them, Boards of Irritation), where he is paid "piece-work." That is, by fees for each sitting—an obvious incentive to create disputes. The expenses are borne by the taxpayers.

"Trade Unionism is encouraged by the Act." So says Mr. Backhouse; and proof is easy to find. Reference has already been made to the fact that the Court has the power to decree that masters shall give preferential employment to Unionists over non-Unionists. "This claim is usually made when there is a reference, and it is frequently accorded by the Court. . . . . In the case of seamen, it was refused; one of the reasons being that it might interfere with the discipline of the ship." Evidently the discipline of the shop is considered to be a matter of no importance. But, we are told, "when the privilege is given, care is taken that it shall not be abused—that it shall not be in the power of a close corporation to dictate terms to the employers." And what are the means taken to safeguard this privilege from abuse? It is invariably accompanied by a condition that a competent workman of good character must be admitted a member of the Union, upon payment of an entrance fee not exceeding 5s., and a weekly contribution of not more than 6d. Could any "safeguard" be more absurdly futile? It simply plays straight into the hands of the Unions by sending them additional members, who must, of course, abide by their rules.

To show the extent to which the administrators of the Act favour Trade Unions, the award given in the boot trade may be cited. "When a non-Union workman is engaged by an employer in consequence of the Union being unable to supply a workman of equal ability willing to undertake the work, at any time within twelve weeks thereafter the Union shall have the right to supply a man capable of performing the work, provided the workman first engaged declines to become a member of the Union. This provision shall also apply to those non-Union workmen already employed." This is taking care that the privilege shall not be abused! Comment becomes superfluous; but let any gas manager in imagination apply the award to his own works. We have, however, done the Court of Arbitration an injustice by omitting to mention one fact: "It is always provided in awards that, where Unionists and non-Unionists are employed together, they shall work in harmony." That, of course, puts everything right; no reasonable man could ask for a better safeguard against Trade Union tyranny! The only thing one would like to know is how the provision is enforced. If harmony does not prevail, we presume the non-Unionists are punished.

The members of the Trade Union fraternity in New Zealand, it may be noted, very closely resemble their brethren in this country. They have an objection to apprentices, similar to that entertained by English Trade Unionists, and frequently ask for provisions in awards limiting the number that may be employed. "The restriction is asked for, not so much in the interest of the apprentice as for the benefit of the existing workmen, who, if their demands are granted, are protected from competition." Again: "Some general complaints were made to me," says Mr. Backhouse, "that the effect of Unionism was to level down, rather than up, the work of individual men; and two specific instances were given me—one where it was admitted, and the other where it was probable, that the quantity of work done was purposely restricted." That sounds painfully familiar to anyone acquainted with labour questions in this country. So does the statement that "they ask for higher wages and shorter hours; for the latter sometimes with a view not so much to working less time as to being paid a higher rate for overtime."

The awards generally, we are told, have been in favour of the workers, and wages have been raised considerably by some awards. This has undoubtedly seriously hampered industry, though Mr. Backhouse expresses an opinion to the contrary. He, however, having expressed that opinion, immediately proceeds to remark that "to attempt to decide whether capital under other conditions would have been invested in particular industries, is to undertake a task which has merely to be mentioned to show its impossibility," and then to give a specific instance of an industry that has been undoubtedly hampered by the operation of the Act. So no weight need be attached to an *obiter dictum* obviously inspired by a desire to say smooth things about the Act. The specific instance given is that of the boot trade, where the conditions imposed by the Court "have been such that this particular trade has not shared in the general prosperity." In spite of a heavy import duty of about 30 per cent. of the cost of freight, insurance, &c., the import of boots is rapidly increasing; while the number of hands employed on boot-making in the Colony is decreasing. "My conclusion is that the conditions under which the industry is now worked are such that, notwithstanding the protection given to it, it is not able to hold its own with foreign competition."

The general effect of the working of the Act has been, in fact, to raise the cost of production, and, therefore, of course, to check the development of industry—a result not so obvious nor so immediately disastrous in a comparatively young Colony such as New Zealand, with a large reserve of undeveloped resources, as it would be in the Home Country, where the fight against foreign competition becomes keener year by year. This general effect of the Labour legislation in New Zealand is, indeed, admitted by Mr. Backhouse, though he appears not to grasp its full significance, perhaps because he is himself a Colonial used to a country still in its youth. He says:

> The effect of the working of the Act has been undoubtedly to make the public pay generally more for the products of an industry which has been regulated by a Board or the Court, when the tariff is high enough or other conditions occur to prevent foreign competition. I have already pointed out that, in the boot trade, the conditions imposed are such that outside producers are able to leap the tariff fence; and a member of the House of Representatives said to me: "If the present duties are done away with, the Act may as well be repealed as far as raising wages in the manufacturing industries is concerned." The coal-mine owners agreed upon an advance in price when the cost of hewing was raised, and the flour-millers acted similarly. Building has become more expensive; and in this trade the contractors at first made very little opposition to the claims for advance in wages, secure as they considered themselves in the ability to pass on the extra cost of construction to those who required their services. Now, however, they are of opinion that the tendency of the awards is likely to narrow the scope of their business (though Mr. Backhouse prefers to think differently); and they are making efforts to oppose more effectually the demands of the men. Cost of living, particularly rent, is becoming dearer, I was informed.

The report further points out that, since the Act came into anything like general operation, trade in the Colony, as elsewhere, has been so active that employment has been easily obtainable by Unionist and non-Unionist alike. It is, therefore, impossible to say the Act will prevent serious trouble when the trade tide ebbs, and employment becomes scarcer. It remains to be seen whether the men will loyally abide by awards that are not to their liking. What evidence there is, in the case of two adjudications unfavourable to the men, rather points to the Act breaking down if awards reducing wages were to become general. In the case of the Typographical Society, the men in one town would not set up the full quantity of matter—contenting themselves with doing only as much as they considered the wage justified, so that a newspaper had some difficulty in bringing out its issues.

The recital of the provisions of the New Zealand Act, and the foregoing notes of some of the effects of its operation, should suffice to persuade all employers of labour in this country that, whatever shall provide a mitigation of industrial disputes and a solution of the eternal labour problem here, it will not, it cannot, be Compulsory Arbitration.

ELECTRIC LIGHTING MEMORANDA.

Coronation Illuminations—Not a Desirable Extra—Fire Risk—Metropolitan Local Authorities' Regulations—Comparative Costs of Incandescent Gas and Incandescent Electric Lights.

The subject of Coronation illuminations is slightly exercising the minds of electricians. Those who belong to the electric lighting branch would like to see their trade well in evidence on this occasion; but it is admitted there are difficulties. In some quarters it is boldly proclaimed that "electricity will play a very prominent part in the celebrations of the 25th, 26th, and 27th of June;" but the promise is immediately followed by the reflection that "the average central station engineer will have a busy as well as an anxious time." It is freely admitted that opinions in the profession differ as to the desirability of this expected additional business. Doubtless, in many places where the central station plant is in excess of the ordinary demand, some profit might be made at such a time at the cost of burning a little more coal; but it is realized that the extra amount of trade can be only a flash in the pan. There will be little money in it at the best; and unless there happens to be spare plant available, as already referred to, "it is questionable whether it will be worth while to consider the matter at all." Of course, there might be the expedient of hiring temporary additional plant for the occasion; but unless this could be had almost for nothing, the increased revenue to be earned "would not do much more than pay the cost of hire and labour of fixing and attendance." Thus writes the "Electrical Review;" and the words are surely words of wisdom. Electricity supply has long passed the stage when a portable engine and a small dynamo in a back-yard were all that was required to make such a show as would attract crowds in the streets. On the other hand, the public are now so familiar with the electric light that, even if familiarity has not produced the proverbial offspring, the mere system of lighting has lost the charm of novelty.

Meanwhile, the interesting question is raised as to how the law of compulsory supply bears upon these temporary demands. The Acts, of course, take no cognizance of "bonfire nights;" and it has been suggested that as there is no express stipulation in this regard, the public can demand a supply without specifying for what period it is required. Probably this is an over-statement, for it would not be difficult to find statutory justification for the view that the principle of compulsion only comes into play in respect of *bonâ fide* applications of such a nature as the undertaking is founded to meet. We are glad to notice that our hint as to the hazardous character of some of the illumination wiring that may be done in a hurry is also expressed by the "Electrical Review," which regards this risk as "perhaps the most serious point in connection with these illuminations." It behoves the Insurance Offices to be on their guard about this—or, probably, it is a matter for the insured, inasmuch as offices are not likely to concede that the ordinary policies cover any extra risk of this character. Hence no prudent person responsible for the care of buildings, public or private, should consider the question of illuminations at all, without first making sure of how the fire risks will be affected by the employment of any particular method.

It is reported that the Metropolitan local authorities having electricity supply undertakings have met in conference to settle the rules to be observed in regard to Coronation illuminations.

They have agreed to a set of regulations which are so excellent that it seems almost a pity they are not likely to be much used. For the adventurer in electric illumination will have much to steady him before he can hope to achieve his laudable ambition to make a display that shall eclipse those of his neighbours and testify to his own loyalty. He must send in an early application, stating the equivalent number of 8-candle power lamps he will require. Applications may be declined after the safe limit of the station or house-lead capacity has been reached. If a special connection is necessary, it will be charged at cost price. Then there will be a charge of 10s. 6d. for testing and connecting; and the price of the supply will be 1d. per 8-candle power lamp, or its equivalent, per unit—all payable in advance. Evidently, therefore, these supply authorities have no idea of working for nothing, even on this auspicious occasion. Special rules are made for temporary wiring, which need not be of the high standard required for permanent connections, although strict orders are given as to the current capacity of the conductors, and so forth. Not more than fifty lamps are to be connected to one circuit, and every circuit is to be brought direct to the temporary switchboard and there controlled by a single-pole switch and fuse in each conductor. A general caution is published that "the whole decoration should be regarded from the fire point of view;" and the amount of inflammable material—including electric light wires—is to be kept as low as possible. There is not in these rules much warmth of invitation to would-be illuminators; and it is not very likely on the face of it that the authorities will be greatly troubled with applicants anxious to spend their money in this fashion. The "Review" concludes its notice of the subject with the repeated reflection that it is questionable whether the Coronation illuminations, from the station engineer's point of view, will be sufficiently profitable to compensate for the additional work, worry, and risk. We should say that the question answers itself, so far as the station interest is concerned.

Our good contemporary the "Electrician" this week has suffered the grievous inconvenience of having its breath taken away by the audacity of a circular issued by the Crystal Palace District Gas Company in connection with the Company's incandescent light maintenance scheme, which calmly claims that the cost of this method of lighting, at the price charged for gas by the Company, which is 2s. 7d. per 1000 cubic feet, "is less than one-tenth of the cost of electricity when sold at 6d. per unit for an equal amount of light." Upon this our contemporary says, "We challenge the Company or any gas authority to prove this amazing statement." Surely there is no difficulty about that, and we will essay the stupendous task in few words. A lighting duty of 20 candles per cubic foot of gas is fair for incandescent mantles reasonably well attended to, such as the Company in question offer to do, which works out to 20,000 candles per 1000 cubic feet of gas, costing 2s. 7d. The average high-pressure electric incandescent lamp cannot be credited with a better duty than 4 watts. per candle-power on a public circuit. This is after the rate of 250 candles per unit, costing 6d., or for 20,000 candles eighty sixpences = £2. According to this calculation, the comparison made by the Company is well within the mark. Where is the error? The "Electrician" must recant, or show cause why we ought to do so.

THE "VIVID" INCANDESCENT MANTLE, AND OTHER POINTS.

"What's in a name?" asked Shakespeare; and he allowed a little contempt for appellations to escape him when he added, "That which we call a rose, by any other name would smell as sweet." No one will deny that there is some truth in this; but had our great playwright lived in these days of militant commerce, he would have learnt that there is often much profit in a name, and that, in the commercial world, men even go to law to defend their right to retain a distinctive title for their commodities. A name easily remembered, and one which aptly describes the character of the article upon which the name is conferred, frequently brings more custom to that article than to others with less suitable titles, but which may be equally as good. The mantle which has been called the "Vivid" is fortunate in its title. It is a name which will be readily borne in memory, and it is one which correctly describes the mantle as a giver of light. This being so, we are likely to hear a good deal of the mantle in the competition which is coming along in the incandescent market, particularly if it continues to make good its claim to durability. On this point, more presently.

We have heard of the "Vivid" mantle for nearly two years past; but the Company who have acquired the patents for this country have not been anxious, in the unsettled state of incandescent affairs here and the fear of gas consumers, to jeopardize its future by hurriedly pressing it forward. They have now, however, been trading (from offices at 60A, Wilson Street, E.C.) for some four months; and therefore the time is opportune for bringing the mantle to the notice of our readers. The delay, we are told, has not been time wasted, as it has enabled various little improvements to be made in the original manufacturing recipe which will give greater satisfaction to users. The mantle is the invention of a German scientist, who, information says, has devoted himself to bringing it to an almost faultless condition, so far as mantles can be made so; and, if it is not brought to a still higher state of perfection, it will not be for the want of further effort. The mantle is of the thoria-ceria class; but, in the finished article, there is an entire absence of free acid. Great value is set upon this fact; the claim being that, there being no free acid, there is no degeneration in quality from the time the mantle is put into its protective case until it reaches the user's burner. In the process of manufacture, the cotton fabric is dipped into a basic solution of rare earths, and subsequently into arsenic acid or antimonic acid; and there is produced throughout the mantle insoluble arsenates or antimonates, with no nitric acid set free. Uniformity of quality of the mantles is claimed; and the assurance is confidently given that the lighting results obtained from one mantle may be depended upon in future supplies. If this be so, it will be a consideration, as it has not been the common experience with certain makes. We have had samples of the "Vivid" mantles in use under ordinary lighting conditions; and of the brilliance of the light there can be no question. But this is merely the experience of a few days.

However, to set our minds at rest as to the lasting illuminating power of the mantle, the results of tests made at the Imperial Physical and Technical Institute at Charlottenburg were handed to us; and they are rather astonishing. The pressure of the gas used was about 33 mm. water (say 1¼ inches); the mantles were burned off in the laboratory of the Institute; and the tests were made with a common burner. The results during 2000 hours' burning are as follows:—

Average Horizontal Lighting Power in Hefner Candles.*	Hourly Consumption of Gas, Litres.		Hours of Burning.
	Total.	Per Hefner Candle.	
97	126	1·3	1
95	125	1·3	100
91	127	1·4	200
93	127	1·4	300
89	127	1·4	400
88	126	1·4	500
90	125	1·4	800
86	126	1·5	1100
80	127	1·6	1400
78	126	1·6	1700
81	126	1·6	2000

* An English candle equals 1·14 Hefner units.

It will be observed that the highest illuminating power was obtained during the first hours of use; and from that point there was a gradual diminution of 6 Hefner candles during 200 hours' burning. But 6 candles on an initial illuminating power of 97 Hefner candles is an unimportant loss. After this, there is a remarkable consistency up to 1100 hours' use; and beyond that there is little loss up to 2000 hours' burning. With such testimony, it is not surprising to learn that the mantle has gained for itself a gold medal in Dresden this year.

Now as to durability, and for the moment speaking generally. In recent trials of mantles, under ordinary burning conditions, we have been disappointed with the frequency of early fracture. In some cases, cheap makes of mantle which have at first given every satisfaction have, in later supplies, been very disappointing. Makers of mantles must look to it, if they wish to retain business, that they give to the user a reliable article, because a frequent replacement of mantles will soon make the user's heart sick, and he will quickly carry his patronage elsewhere. The manufacturer is a dolt who thinks he will build up in this country a sound business on the unstable foundation of inferior production. The old dodge of giving a good article at the outset, and an inferior one later will not answer here. The "Vivid" mantle we have not had in use sufficiently long to speak of its structural strength; but it is rather material proof of satisfaction in this respect when we are shown trial orders from gas companies and corporations supplemented at later dates by substantial demands for supplies—accompanied by gratifying testimony as to experience, signed by well-known gas engineers. In those samples of the mantle which we have tried for a few days, there is no sign of fracture. Our only trouble has been that some of the ordinary forks purchased at a general incandescent fittings shop are hardly long enough for the mantles, the network part of which is about 3½ inches long. But the "Vivid" Company are putting suitable forks on to the market, which are said to possess the virtue of becoming more and more toughened by use. The point as to having a height of fork suitable to the length of mantle is one which should not be overlooked, as, with the supports on which we have tried these "Vivid" mantles, quite ¾ inch of incandescent surface has been lost. In the mantle competition of the future, we shall look for the "Vivid" among the popular makes.

Masonic.—Notwithstanding the very satisfactory efforts of those interested in the case, the late Mr. F. G. Burfield's son was unsuccessful at the ballot last Friday in securing election into the Royal Masonic Institution for Boys. On that day 2634 votes were polled for him; so that, with the 718 votes given at the previous election, there are 3352 votes to carry forward towards the election in October. The case stood twenty-sixth on the list; the last of the successful candidates having polled 5105 votes. If the friends interested will support the case as satisfactorily next October as on the present occasion, there is no doubt young Burfield's candidature will then be successful.

AUTOMATIC LIGHTING AND EXTINGUISHING OF LAMPS.

When the members of the Gas Section of last year's Glasgow Engineering Congress discussed the question of the automatic lighting and extinguishing of street-lamps, Mr. Charles Carpenter advanced an argument in favour of such a system which, given an efficient and durable appliance, is unanswerable. "It seemed," said Mr. Carpenter, "unsatisfactory to have a staff of men over the whole area of a city for the purpose of lighting and extinguishing the lamps. Take, for instance, the South of London. They had an area of 50 or 60 square miles; and it seemed unsatisfactory to have to start men off every night to light up the lamps, and then again in the early hours of the morning to extinguish them." Accepting Mr. Carpenter's authoritative assertion that the present manual method of lighting and extinguishing public lamps is unsatisfactory, the only alternative is an automatic system, which, in a comparison with the present order of things, must prove itself from three essential points—reliability, durability, and cost. The comparative cost will be the dominating factor; but a superiority even in that respect will fall before any weakness in mechanism which tends to unreliability.

However, we intend dealing in this article with the three points named, in describing, and quoting experience obtained with, a lighting and extinguishing device mentioned by Mr. T. Holgate in the discussion from which we have extracted Mr. Carpenter's remarks. The appliance referred to is Mr. John Gunning's, of Bournemouth; and we have recently had an opportunity of inspecting its action at the office of the Automatic Light Controlling Company, at 39, Victoria Street, S.W. The arrangement is one for fixing to every gas-lamp; and this individual application of an automatic system of lighting and extinguishing appears to be preferred by engineers to the original electrical and other circuit systems, any hitch in which generally affects a large number of lamps. Mr. Gunning's arrangement is very simple; and we should fancy that it would be more positive and reliable in its action than any valvular device, although this is a mere expression of opinion given without experience of the latter form. The appliance is screwed on to the top of the gas-supply pipe, and the burner on to the top of the connection thus formed. This inserted junction between the supply-pipe and the burner contains a cock, pierced, as required, for the passage of gas to one burner or more, and for the feeding of a bye-pass when the lamp is not alight. Attached to the cock, on the outside, is a cog-wheel; and the movement of this in the manner to be described actuates the cock for the passing or cutting off of the gas supply. To one side of this cock-containing piece is joined a cylindrical casing containing clock work, which experience has improved to a pitch suitable for this special purpose. In the place of the ordinary clock face, there is a movable disc, which is perforated with 24 holes close to its perimeter, each representing the hours of the day; and it therefore follows that the disc makes one revolution in the 24 hours. Now in the case of a single burner, this disc is fitted with two adjustable pawls, which can (by thumb-screws) be fitted—one into the hole representing the hour at which the gas is to be ignited, and the other into the hole representing the hour at which the light is to be extinguished. The ends of these pawls project beyond the disc, and they engage, at the prescribed hour, with the cog wheel of the cock. This is the arrangement as applied to a single burner; and there is very little difference between it and the form applied to a cluster of burners.

Before explaining the difference, let us state the simple attention which the arrangement needs for its operation. The mechanism runs for eight days on one winding; and, consequently, the attendant has only to visit each lamp once a week, when he can make such adjustments of the pawls as are necessary for the altered times of lighting and extinguishing. All that is required of him is to loosen a screw, place the part of the disc which corresponds to the time of his visit directly opposite the nearest tooth of the cog-wheel, and then fix the pawls—one in the hole of the hour of lighting up, and the other in the hour for extinguishing. After tightening the screws, no further attention is needed for a week. The contact of the first pawl with the nearest tooth of the cog-wheel, gradually opens at the proper hour the gas-way to the burner, and the gas is ignited by the bye-pass jet. The movement of the disc during the allotted span of lighting brings the second pawl into play, and, at the specified hour, it engages with the next tooth of the cog-wheel, and gradually turns the cock, and so closes the gas passage—leaving open only the gas channel to the bye-pass. During the time the burners are alight, the bye-pass jet is extinguished.

In the case of clusters of lights, slight alterations in the arrangements will permit of the whole of the lights being in operation during the busiest hours of the evening and night; part being extinguished at a given hour, and the remainder at a later hour. Take, as an example, a cluster of three burners where all are required to be alight say from 7 o'clock in the evening till midnight; then only one burner after midnight, and that extinguished at 5 a.m. Three pawls are used in this case; and one would have to be screwed to the 7 o'clock hole, one to the 12 o'clock hole, and the third further on in the five o'clock hole. The supply passages in the cock are pierced slightly different in this case; and, of course, the teeth on the cog-wheel have to be arranged accordingly. The movement of the cog-wheel by the first pawl opens the gas supply to all the burners; the movement by the second pawl closes the supply to two of the burners; and the movement by the third pawl shuts off the supply to the third one. At the offices of the Company mentioned, the action of both forms of appliance has been satisfactorily demonstrated; and trials can there be readily made with specimens by releasing a little pin (provided for the purpose) which controls the escapement of the clock mechanism. It should be mentioned that variations of quarter and half hours in the times of lighting and extinguishing are arranged for by the attendant when adjusting the perforated disc.

Now as to the points regarding reliability, durability, and cost; the three are so intimately wrapped up together that they may be dealt with at the same time. Mr. Gunning has been working at the perfecting of his arrangement for the past five years. At first, he devoted his attention to the automatic extinguishing of lights only; but a very little development of the ingenious contrivance enabled it to perform the whole cycle of operations. The early form, for extinguishing only, has been in use at Bournemouth on nearly 200 lamps for the past three years; and the following is an extract from a noteworthy report by the Lighting Inspector as to the net saving (in labour) per annum to the Corporation by the use of the appliance on 162 lamps:—

Three men at 10s. per week each, who would be required if the lamps were extinguished by hand	£78	0	0		
Estimated saving of gas	10	0	0		
Estimated saving in mantles, 10 per cent.	2	0	0		
				£90	0	0
Deduct—					
Rent of 162 extinguishers at 5s. each per annum	£40	10	0		
Man's time adjusting extinguishers	6	0	0		
				46	10	0
Net saving per annum *(extinguishing only)*				£43	10	0

This report, it should be emphasized, deals only with the extinguishing of the lamps; but now that the appliance provides for lighting as well as extinguishing, the saving in other cases should be largely augmented. Every engineer will be able to make calculations from his own experience as to what saving can be effected in labour, something on these lines: Supposing a man's round under the torch system comprises 75 lamps. He has to visit them twice a day, which equals 150 visits, or 1050 visits in seven days; but only part of his time is occupied. In the case of automatic appliances, a little longer time would be required by a man on his one visit each week (instead of fourteen visits as now) to wind and adjust the device; but, the simple work required of him considered, it is not too much to calculate that one man would be able to attend to over 1000 lamps a week. To the wages of the man must be added the rent of 5s. per annum per lamp to be paid to the Automatic Light Controlling Company, which 5s., by the way, it is important to note, includes maintenance. Against this total cost has to be set in the comparison the total expense of the staff of lamplighters at present engaged. But it is obvious that there would also be a saving in the consumption of gas through the simultaneous lighting and extinguishing of the lamps; and, again, the lighting up of incandescent mantles without shock of any kind is a point in favour of the appliance, and one which must contribute to saving. In the private demonstration previously referred to, it was curious and interesting to see the mantles gradually and gently becoming incandescent from the bottom, without the slightest movement of the mantle, and without any personal or visible external act. Of course, the device is applicable to any kind of burner.

Further as to reliability and durability, we have again to refer to the experience of others. The inventor with his five years' work, has, he claims, brought the mechanism to a state of perfection; and every appliance is tested thoroughly before leaving the works. The fact that the rent includes maintenance must be regarded as favourable evidence on the point. A testimonial of good behaviour is likewise afforded by one of the big lights on Bournemouth Pier, to which one of the appliances has been fitted for over three years. It has, notwithstanding the severity of the weather in that exposed position, held for itself a continuous record for accurate working. Several engineers have tested samples of the contrivance; and, among others, Mr. Humphrys, of Salisbury. Writing in February last, he states that, in a six months' trial of twelve fitted lamps, there has been no single stoppage or failure. Mr. George Lane, of Aylesbury, tells an equally satisfactory story of successful operation. We cannot go outside the experience of others in speaking of reliability and durability. But in view of the admission that the present condition of things in regard to the lighting and extinguishing of public lamps is unsatisfactory, we have stated the case for the appliance in the most favourable light, in order to gain for it a general trial. We understand that the Automatic Light Controlling Company are willing to allow gas engineers a two months' trial of a specimen free of charge; and perhaps several will take advantage of this. North of England Gas Managers will be able to witness its operation at the forthcoming Exhibition of the Newcastle and Gateshead Gas Company; and Southern engineers can see it at the offices of the Company, and will very soon be able to witness its actual operation in certain situations in the streets of London.

The progress made by Mr. Gunning in improving his appliance has been recorded in our "Register of Patents." The first reference appeared in Vol. LXXI., p. 1195; and the second in the following volume, p. 1418. A third will be found in Vol. LXXVI., p. 1341.

TRADE IN THE MARCH QUARTER.

The Board of Trade returns for the past quarter, compared with those for the same period of 1901, show that the decline in trade which was so marked in the first quarter of last year has not developed yet into anything like a serious depression, while, on the other hand, there has been no material revival—no sign of a return to the extraordinary state of the markets in 1899 and 1900. To quote the total figures of either imports or exports would be useless—in fact, misleading—unless the necessary corrections for fluctuations in prices, the influence of budget anticipations, and the different incidence of the Easter holidays were made. We will, therefore, only consider those items in the nation's trading accounts that bear most directly upon gas-works finances.

Coal and Coke.

The exports of coal fell off very heavily in the first quarter of last year—so materially, indeed, as very appreciably to affect the home market, enabling the spring contracts to be negotiated upon a lower basis than the collieries had anticipated. This year, unfortunately, while the output of coal has been declining, the exports have increased, compared with 1901, though they have not gone back quite to the high-water mark of 1900. The following comparison is instructive.

Coal, &c., Exported and Shipped by Merchant Steamers.

March Quarter.	Tons.	Price Realized (Exports only.)
1899	12,558,900	10s. 4d. per ton.
1900	13,114,155	15 8 ,,
1901	12,334,572	14 6 ,,
1902	13,012,958	12 8 ,,

A total exportation that, in spite of the Easter holidays this year falling in the first quarter, and in spite of the 1s. export duty, only falls short of the record shipments in 1900 by 100,000 tons, is truly remarkable. The principal increase is shown in our sales to Italy, which in the first three months this year exceed those for the same period of both preceding years by more than 200,000 tons. The strong home demand for coal that has prevailed in the United States for some time past is reflected in increased shipments of British coal to Brazil and the East Indies. The British coal consumer is getting no relief at present from the competition of American with British coal in foreign markets.

The exports of coke, which were returned separately from coal for the first time last year, show a decrease in the past quarter of over 20 per cent.; the figures being 136,503 tons, valued at £112,429, this year, against 174,945 tons, valued at £179,641, in 1901. The average price realized, it will be seen, has fallen from 20s. 6d. to 16s. 6d. per ton.

Iron and Steel.

The exports of iron and steel goods show a slight recovery from the very poor figures of 1901, the aggregate being almost as large as that for the first quarter of 1899, which was by no means an unprosperous year. The most unfavourable sign for our manufacturers is the considerable increase in the imports, which were exceptionally heavy in consequence of the great depression in Germany and Belgium. This led to large quantities of stuff being shipped to England at a sacrifice, in order that stocks might be turned into money, and the losses cut. The following tables give the most important particulars.

Iron and Steel Exported.

March Quarter.	Tons.	Value.
1899	708,653	£5,473,155
1900	962,457	8,248,268
1901	616,826	6,030,258
1902	675,697	6,146,769

Iron and Steel Imported.

March Quarter.	Tons.	Value.
1899	97,972	£408,920
1900	43,145	274,826
1901	104,049	601,227
1902	165,094	779,389

The most noteworthy feature of the details of the returns of the iron and steel exports and imports is the reversal of our relationship with the United States during the past quarter. In the first three months of 1901, we imported 24,623 tons of pig iron and 38,856 tons of unwrought steel from the States, and exported thereto 4823 tons of pig iron and 2264 tons of unwrought steel. This year we imported 3598 tons of pig iron, and 1002 tons of steel, while exporting 24,687 tons of pig iron and 4631 tons of steel. Balance of exports over imports: 1901, pig iron, — 19,800 tons; steel, — 36,592 tons. 1901, pig iron, + 21,089 tons; steel, + 3629 tons. These figures very clearly show the decline in demand here, and the extraordinarily strong demand existing at present in the United States, especially when the tariff in force there is borne in mind. They also show that, by reason of the shifting of the balance of trade between the two countries, our manufacturers were called upon to make during the past quarter about 80,000 tons of iron and steel more than they would have had to make had 1901 conditions prevailed.

Coal Products, &c.

The value of coal products exported during the quarter decreased from £474,059 in 1900, and £359,224 in 1901, to £295,943 this year. Chemical manure shows an increase both in tonnage and in value, the figures for the quarter being: 1900, 97,028 tons, and value £691,547; 1901, 78,856 tons, and value £585,386; 1902, 106,453 tons, and value £711,082. The principal increase is in the shipments to Germany and France. Those to Spain show a considerable decline.

A SEMI-TECHNICAL VIEW OF GAS AND GAS FITTINGS.*

It is an old complaint of gas engineers that architects and builders do not in general make proper provision for the gas supply of buildings, with the result that gas cannot do itself justice. Several reasons are usually given for this constructive maltreatment of gas at the hands of those whom it could serve to better advantage, if permitted to do so, of which the first is ignorance of the subject. The gas supply of buildings is a sort of accessory which is not architecture. There is no "style" about it; and therefore the architect who fancies himself as an artist in sky-lines or mouldings does not trouble about the gas fittings, and has no interest even in the design of gas-lamps. The builder works to his specification, or, if he is building on his own account, he does the necessary amount of gas fitting on the basis of strictest economy. Our excellent contemporary, the "Builder," has of late laid itself out to provide architecture and building students with every kind of useful information about the necessary things which both the profession and the trade must know, although they are not much talked about at institution meetings. Among other essential matters, gas has been very properly included; and very well indeed was the work of instruction done by the specialist selected for the task. We consider that an ample meed of recognition is due to the "Builder" for these excellent instructional articles, which should once and for all remove the reproach of ignorance of gas and gas fittings from those who follow the line of technical study so thoroughly well prepared by our contemporary.

The book in which all this gas lore has been collected for publication, and for which Mr. H. F. Hills, F.C.S., stands sponsor, is extremely good, so far as it goes; and it goes very far, with a degree of correctness which commands the admiration of a reviewer of such books, who is only too familiar with the usual result when the author is not quite at home in the particular branch of the technic which he undertakes to tell all about. We own to feeling a dash of disappointment at seeing the letters "F.C.S." after this author's name; for we had rather that he who writes about gas fitting should himself be a fitter. Unfortunately, the right men will not do this kind of work. There are some studies which tend to make their followers prolific of papers and books, whereas others are different. And of all the paper-writing professions in existence, that of chemistry is far and away the most prolific. Those who have to do the reviewing of chemical books have long since cried a halt to the production of manuals of elementary chemistry; and accordingly, as chemists apparently must write about something, they seize upon gas manufacture, or petroleum, or anything with which a chemist may be supposed to have a nodding acquaintance, and their credentials as chemists are noted on the title-pages of books which might as well be introduced to the public under other auspices.

Well, now, this growl of ours is not a mere empty noise. Mr. Hills's little book, as we have already owned, is very good. It is quite as good as a clever bookmaker, whose own speciality is just outside the subject-matter, could be expected to put together with the available materials. The compiler has really overlooked nothing that appealed to him as pertinent matter, and he has added to the collection of facts some excellent observations of his own. But, of course, with this painstaking labour, conscientiously done in the light of sound knowledge in chemistry, which is occasionally shed over the matter to the great advantage of the student, the merit of the work ends. Actual gas fitting begins, that is to say, when Mr. Hills perforce leaves off. He is like a hodman of technical literature—and how many such there be!—who brings the materials, and is even able to pick out good from bad, but is obliged to leave the putting of them together. We are constrained to state this limitation, in order that possible purchasers of the book may know beforehand what it is like. But the shortcoming, such as it is, does not spoil the value of what the book does contain. We have given an unusual amount of time and care to the examination of Mr. Hills's work, with which we were from the first most favourably impressed, and can unreservedly recommend it to all who seek accurate information concerning the actual state of gas supply and gas consuming appliances.

When the nature of the subject-matter enables the author to write of it from his own knowledge, he is very good indeed. For example, he appeals to the attention of the technician in gas supply on the fourth page of his Introduction, where he remarks that "the manufacture of gas of different composition, specific gravity, illuminating power, and calorific value in different localities, has rendered it necessary for a purchaser of gas appliances to take into consideration the district in which the appliances are to be fitted, if they are to be used under the most favourable of

* "Gas and Gas Fittings. A Handbook of Information Relating to Coal Gas, Water Gas, Power Gas, and Acetylene. For the use of Architects, Builders, and Gas Consumers." By H. F. Hills, F.C.S. ("The Builder" Student's Series). London: D. Fourdrinier, and Whittaker and Co.

conditions. Satisfactory use of gas is, moreover, made difficult by fluctuations in the pressure of the gas supplied." There is more of the same character, which will sufficiently indicate the soundness and modernity of the author's views. Indeed, he is in many respects calculated to be a better mentor for gas suppliers than for those to whom the book is ostensibly addressed. He is quite up to date on the question of low and high illuminating power; and the book should be in the hands of every gas manager and gas engineering student, if only on this account, that it is the first technical handbook to treat satisfactorily of this question of the day. It is gratifying to be able to compliment Mr. Hills upon having been able to discern the truth in this involved matter, where it is so easy to make a mistake, either through carelessness, want of perception of the factors and their value, or even sheer obscurantism. Almost for a wonder, he is absolutely fair to gas manufacturers, whom he recognizes to be face to face with the difficult problem of what to do for the best in the new conditions under which the gas industry must meet the future. Why is not Mr. Hills a London Gas Referee? Where he blames the gas manufacturer, as for not being half particular enough about keeping up a good and steady pressure in the district, we unreservedly support him. There has been much talk about the inconvenience caused to gas consumers by alterations of the composition of the gas sent into the district; but a proper attention to the pressure would cure all that.

There is no opening for criticism in Mr. Hills's account of the manufacture of gas, which is one of the best and most condensed epitomes of the subject in existence, if not the actual best. The author is an absolutely safe guide through all the mazes of the technic he traverses, which is the highest possible praise. One does not know what interest much of the matter has for architects and builders; but it will certainly do them no harm to have it by them, and we can assure them that all this elementary information is reliable—which can so rarely be said of such work! Their particular needs are first met when the writer comes to treat of the fixing and selection of the sizes of consumers' meters and the service-pipe. He is not so full of this part of the subject as a regular gas-fitter would be, getting over in a couple of pages what a careful tradesman would fill a chapter with, and would certainly illustrate with many drawings of what should be done and avoided. Mr. Hills tells all about consumers' governors, and the conditions under which burners can be used to the best advantage. He has brought together all that is worth knowing on the subject of burners, including the chief points of the physics of incandescent gas lighting—the authorities cited including Bunte, Strache, and Lewes, and the matter being as late as the contributions to the Glasgow Engineering Congress. This is one of the great merits of the book. All this abstracting work is intelligently and helpfully done.

The most glaring defect of the book is the almost complete lack of mention of the theoretical and practical data upon which the employment of gas or any other illuminant for the lighting of either exteriors or interiors should be based for effect. There seems to be almost everything about lights, but nothing at all about lighting, whether for street, display, or ordinary domestic purposes. How ought a shop, theatre, dining room, or library to be lighted? Mr. Hills does not say. When one recalls the exhaustive manner in which some French authors have treated this part of the subject of gas and gas fitting, or even the careful way in which it has been dealt with time and again by English writers, the circumstance of Mr. Hills neglecting the whole matter is difficult to understand. One can only draw the conclusion from the omission, that he never had a job of lighting to do, which goes back to what we said at the beginning of this article about the habit of chemists in rushing in where specialists are shy of treading. Assuredly, the commonest of problems for an architect would be how to light a public school or church. On the Continent, an architect would be expected also to know something about the getting up of street illuminations. Nothing of this sort has entered into the scheme of Mr. Hills; and those who would learn anything about it must look elsewhere.

One would like to be able to commend such a book as this for completeness as well as for accuracy; but it is a pleasure that is denied in the present case. Rather than conclude our notice of the book with blame, however, let us admit that the author lays his finger on the technical problem of the day, when he remarks that "the value of gas for incandescent lighting as used at the present time is not solely dependent upon its calorific power, but the flame temperature per unit of area must also be taken into consideration. Water gas, when consumed in an argand burner at the rate of 5 cubic feet per hour, gives a flame 1 inch in height; whereas coal gas, consumed at the same rate, gives a flame from 2½ to 3 inches in height. Hence a given area of water-gas flame may be of a higher temperature than a similar area of coal-gas flame, although the total heat of the coal-gas flame per unit of gas consumed is twice as great as that of water-gas flame. Possibly a method may presently be discovered of causing the coal gas to burn with a shorter flame (as it does in high-pressure systems), and a higher value of incandescent lighting be obtained from it." The author goes on to remark that extensive experimental investigation is yet required into the relationship between light and heat in the Welsbach system of lighting, with the object of ascertaining if the light increases in intensity with the temperature of the flame. If this is the case, it may be possible to improve on the present method of burning coal gas, to arrive at better results.

There are chapters on acetylene, likely to be useful for country houses. The illustrations of the volume are all new. Some useful forms and tables are given as appendices. The indexing is not very thorough—a common fault.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see p. 972.)

THE feature of the week just closed on the Stock Exchange was that the air was full of rumours of peace, coming to a climax on Friday, when a well-devised *canard* took in a good many people. However, there is still a persistent feeling that pacification is at hand; and the destruction of the *canard* did not have a depressing influence. Business, however, was not very brisk; and attention was chiefly devoted to the settlement of the fortnightly account. Despite the restricted activity, prices in almost every department were better. In the Money Market, there was a brisk demand, especially in connection with the Stock Exchange, and discount rates also ruled firm. Transactions in the Gas Market still continued to be below a normal average, though there was some advance upon the rate of inactivity of the preceding week. Movements in price were much chequered—some good stocks advancing, while others of equal rank receded, the cause of which was not apparent. In Gaslight issues, movements were irregular. The ordinary opened rather inclined to totter; and on Wednesday it fell a point, with business marked at 90½. Then it began to pick up again; and, before the close, it had recovered the lost point, and changed hands at 92¼. But while the ordinary rose, the preference and debenture had each a fall, though there was not much done in them. South Metropolitan was rather quiet, but interesting. It opened weak at 119½, and remained so until the close of the old account. Then it revived; and 122½ was the price on Saturday—the quotation showing a gain of one-and-a-half. No business was marked in Commercials; but both old and new were higher on *ex div.* adjustment. Among the Suburban and Provincial group, there was not much business to speak of. Brentford old receded for some inscrutable reason or other; and in the local Exchanges Liverpool was also put down another point, but Newcastle was fractionally higher. Transactions in the Continental Companies were much restricted. Imperial and European were steady and unchanged; but Union ordinary and preferred had each a fall. Among the remoter undertakings, the only move was a rise in Monte Video. There was hardly any business in the Water Companies, which almost seem to have ceased action while their fate is poised in the balance of the Government measure.

The daily operations were: Gas opened very quiet on Monday, and never became animated all the day. Quotations did not move. On Tuesday, there was much more activity, and prices were rather better. Monte Video rose ½; but Union ordinary and preference fell 3 each. Wednesday was nearly as active as Tuesday; but prices were weaker, and Gaslight ordinary receded 1. Thursday fell quieter; but the tone was a little more favourable. Imperial advanced 1½. Business was slack on Friday. Brentford old fell 3, Union 2, and Gaslight preference and debenture 1 each. South Metropolitan gained 1. The next day was pretty active for a Saturday, and prices were better. Gaslight ordinary recovered 1; and South Metropolitan rose ½.

"A Ray of Light" on the Question of Gas *v.* Electricity.—Gas is subjected to so much misrepresentation by the partisans of electric lighting, that we welcome most heartily any effort that may be made to instil into the minds of the public the true facts of the matter. Much creditable work in this direction has been undertaken in the past; and we have now before us a little pamphlet, entitled "A Ray of Light," by Mr. T. Ebenezer Pye, which contains some interesting comparisons between gas and electricity. The object is to present, clearly and concisely, reliable data relating to lighting by the two systems; and the author has all through the pamphlet kept well in mind the shortcomings of lay readers as regards technical knowledge of the subject under discussion. One very useful chapter consists of examples based on practical working conditions and on actual quarterly bills for gas and electricity respectively. Another is devoted to hygienic considerations; and in this Mr. Pye deals convincingly with the fallacy of the alleged contamination of the air by coal gas with "carbonic acid gas and other injurious organic impurities," and other interesting matters bearing on this aspect of the question. The pamphlet (which is neatly got up, and has a striking front page) is especially suitable for distribution by gas companies among both those who do consume gas and those who do not; and one of the chief features is a comparative statement of the light obtainable from gas and electricity respectively for an outlay of 1s. Arrangements are, of course, made for the alteration of the figures in this table (which is printed on the third page of the cover), so as to make them accord with the prices of the two lights in the particular district in which the pamphlet may be intended to be circulated. A glance at the table would make the advantages of gas clear to the very meanest intelligence; and this is necessary, seeing that the pamphlet is addressed to "all sorts and conditions of men." We congratulate Mr. Pye on having struck an effective blow in the good cause which he and we have so much at heart.

ACCOUNTS OF THE METROPOLITAN GAS COMPANIES FOR THE YEAR 1901.

—	Chartered.	Commercial.	South Metropolitan.	All the Companies.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Capital and borrowed money	27,553,847 11 9(a)	1,127,753 8 10	7,477,965 0 0(a)	36,159,566 0 7
Income—viz.:				
Sale of gas by meter	3,370,194 9 5	355,908 1 10	1,291,081 11 3	5,017,184 2 6
Public lighting, including lighting under contracts	164,713 11 5	19,101 8 5	59,131 16 7	242,946 16 5
Rental of meters and stoves	52,467 10 7*	17,914 8 7	82,970 3 1	153,352 2 3
Residual products	957,787 13 2	94,095 0 0	563,672 19 4	1,615,555 12 6
Miscellaneous, including old materials	21,530 10 0	1,244 3 2	9,372 16 8	32,147 9 10
Total income from all sources	4,566,693 14 7	488,263 2 0	2,006,229 6 11	7,061,186 3 6
Expenditure—viz.:				
Coal and oil, including carriage and dues	1,987,239 14 3	227,945 8 2	889,634 19 6	3,104,820 1 11
Purifying materials, including labour	105,517 12 5	16,141 0 3	42,554 13 1	164,213 5 9
Salaries and wages—manufacture	373,520 17 2	44,620 2 9	152,173 17 2	570,314 17 1
Wear and tear—manufacture	453,940 11 4	40,056 19 5	223,226 10 1	717,224 0 10
Rents, rates, and taxes	285,968 7 7	18,175 12 7	65,281 8 8	369,425 8 10
Salaries—management	22,826 13 11	2,407 8 9	5,382 9 6	30,616 12 2
Collectors' salaries and commission	42,848 12 3	4,262 10 11	19,495 11 9	66,606 14 11
Stationery, printing, and general charges	20,641 6 6	2,730 12 3	19,543 14 7	42,915 13 4
Directors and auditors	5,946 4 0	2,650 0 0	3,815 12 11	12,411 16 11
Salaries and wages, wear and tear—distribution	173,850 19 0	13,596 15 7	107,593 8 4	295,041 2 11
Repair and renewal of meters and stoves, &c.	128,866 15 9	12,743 0 10	67,543 17 1	209,153 13 8
Law and parliamentary charges	4,390 13 6†	754 12 11	6,395 8 1	11,540 14 6
Bad debts and extraordinary expenses	48,274 12 5‡	6,595 1 10	26,336 11 8§	81,206 5 11
Total expenditure on revenue account	3,653,833 0 1	392,679 6 3	1,628,978 2 5	5,675,490 8 9
Gross profit	912,860 14 6	95,583 15 9	377,251 4 6	1,385,695 14 9
Do. per cent. on capital and borrowed money	3 6 3	8 9 6	5 0 11	3 16 8
Do. do. gas-rental	25 16 6	25 9 9	27 18 9	26 6 10

(a) Converted. * Stoves only. † Including £680 balance of charges re quinquennial revaluations. ‡ Including annuities, £30,184; and £2429 on workmen's compensation account. § Including £94·8 paid to pension, &c., funds, and £10,357 paid under the profit-sharing scheme.

TABLE *showing the Capital, Income, Expenditure, and Profit, per Ton of Coal Carbonized (including Oil), in* 1901.

—	Chartered.	Commercial.	South Metropolitan.	All the Companies.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Capital and borrowed money	12 1 10·98	4 9 3·43	6 5 8·84	9 14 4·84
Income—viz.:				
Total gas-rental	1 11 0·42	1 9 8·28	1 2 8·43	1 8 3·36
Rental of meters and stoves	5·53	1 5·02	1 4·74	9·90
Residual products	8 4·91	7 5·40	9 5·73	8 8·22
Miscellaneous, including old materials	2·27	1·18	1·90	2·07
Total income from all sources	2 0 1·13	1 18 7·88	1 13 8·80	1 17 11·55
Expenditure—viz.:				
Coal and oil, including carriage and dues	17 5·37	18 0·56	14 11·50	16 8·30
Purifying materials, including labour	11·12	1 3·33	8·59	10·60
Salaries and wages—manufacture	3 3·35	3 6·39	2 6·71	3 0·80
Wear and tear—manufacture	3 11·82	3 2·05	3 9·04	3 10·27
Rents, rates, and taxes	2 6·13	1 5·27	1 1·17	1 11·83
Salaries—management	2·40	2·29	1·09	1·98
Collectors' salaries and commission	4·51	4·05	3·93	4·30
Stationery, printing, and general charges	2·17	2·59	3·94	2·77
Directors and auditors	0·63	2·52	0·77	0·80
Salaries and wages, wear and tear—distribution	1 6·32	1 0·92	1 9·71	1 7·03
Repair and renewal of meters and stoves, &c.	1 1·58	1 0·11	1 1·63	1 1·49
Law and parliamentary charges	0·46	0·72	1·29	0·74
Bad debts and extraordinary expenses	5·09	6·27	5·31	5·24
Total expenditure on revenue account	1 12 0·95	1 11 1·07	1 7 4·68	1 10 6·15
Gross profit	8 0·18	7 6·81	6 4·12	7 5·40

TABLE *showing the Increase or Decrease in each Item during* 1901 *compared with* 1900.

—	Chartered.		Commercial.		South Metropolitan.		All the Companies.	
	Inc.	Dec.	Inc.	Dec.	Inc.	Dec.	Inc.	Dec.
	£	£	£	£	£	£	£	£
Capital and borrowed money	281,631	..	24,502	..	168,115	..	474,248	..
Income—viz.:								
Sale of gas by meter	199,696	..	8,749	..	81,572	..	290,017	..
Public lighting, including lighting under contracts	1,382	..	..	1,830	..	319	..	767
Rental of meters and stoves	3,887	..	1,839	..	7,759	..	13,485	..
Residual products	..	186,821	..	1,259	..	75,028	..	263,108
Miscellaneous, including old materials	2,704	..	200	..	..	231	2,673	..
Total income from all sources	20,848	..	7,699	..	13,753	..	42,300	..
Expenditure—viz.:								
Coal and oil, including carriage and dues	147,476	..	..	6,778	..	102,427	38,270	..
Purifying materials, including labour	25,326	..	..	1,128	..	2,364	21,834	..
Salaries and wages—manufacture	..	17,823	1,790	..	12,267	..	..	3,766
Wear and tear—manufacture	58,289	..	4,919	..	39,388	..	102,596	..
Rents, rates, and taxes	19,647	..	2,281	..	1,908	..	23,836	..
Salaries—management	606	..	76	..	579	..	1,261	..
Collectors' salaries and commission	1,139	..	197	..	1,267	..	2,603	..
Stationery, printing, and general charges	..	1,927	220	..	4,518	..	2,811	..
Directors and auditors	..	15	..	..	9	..	..	6
Salaries and wages, wear and tear—distribution	..	3,560	..	2,057	9,068	..	3,452	..
Repair and renewal of meters and stoves, &c.	..	34,917	916	..	16,642	..	..	17,359
Law and parliamentary charges	..	6,423	..	709	..	2,697	..	9,829
Bad debts and extraordinary expenses	..	161	1,470	..	..	1,370	..	61
Total expenditure on revenue account	187,657	..	1,197	..	..	23,212	165,642	..
Gross profit	..	166,809	6,502	..	36,965	..	..	123,342
Do. per cent. on capital and borrowed money	..	£0 12s. 11d.	£0 8s. 0d.	..	£0 7s. 9d.	..	..	£0 7s. 11d.
Do. do. gas-rental	..	6 11 3	1 5 8	..	1 2 5	..	..	4 0 4

OBITUARY.

On Tuesday last, there passed away, in the person of Mr. JOHN F. TAYLOR, one of the best-known public men of York. Among the many offices which he held for a considerable period, were those of Chairman of both the York Gas Company and the York Water Company. He had reached the ripe old age of 83. The deceased, who leaves two sons and two daughters, was a generous supporter of many religious and other local institutions.

The many friends of Mr. JULIUS SILVIUS TAMBURINI will share the regret with which we announce the sudden death of that gentleman on the 6th inst., at his residence, Church End, Finchley. Deceased was for many years—in fact, from 1865—with Messrs. Stephenson Clark and Co., but about four years ago, the firm were deprived of his services by a paralytic seizure, from which he never recovered. He was a member of the Evening Star Lodge; and by the brethren, as well as by all with whom he had relations, he was very highly esteemed. The funeral took place at Woking Cemetery last Thursday.

The members of the Southern District Association of Gas Managers, as well as the many private and professional friends of Mr. J. W. HELPS, of Croydon, are aware that the precariousness of the health of Mrs. Helps was for him a source of constant anxiety. Health resorts at home and abroad were tried in the hope of obtaining some alleviation of her suffering; the last place visited being Worthing. Here, we are sorry to learn, she passed away early last Friday morning. We join in the very general expression of sincere sympathy which will be accorded to Mr. Helps in his great bereavement.

We regret to learn that the members of two firms whose names are familiar to our readers have just sustained a severe bereavement. On Friday, the 4th inst., Mrs. SKIDMORE WESTWOOD, wife of Mr. W. Skidmore Westwood, one of the partners in the firm of Messrs. Westwood and Wright, succumbed to serious illness attendant upon the birth of a daughter the preceding day. The deceased lady was the only daughter of Mr. and Mrs. Henry Perry, of Thornleigh, Stourbridge (her father being a member of the firm of Messrs. Mobberley and Perry), and was widely known and esteemed. We are sure the local sympathy extended to both families will be shared by all who know them.

PERSONAL.

We were able to announce in the "JOURNAL" for the 1st inst. that 36 applications had been received for the post of Superintendent at the Swan Village Gas-Works, Birmingham, recently advertised in our pages, and that from this number Mr. Henry Hack would select half-a-dozen to have an interview with the Gas-Works Sub-Committee. We now learn that the Committee have unanimously appointed Mr. THOMAS H. HACK, late of Sheffield, to the position.

Mr. J. H. SHELDRAKE, who is well known to many of our readers as being formerly Manager to Messrs. D. Hulett and Co., Limited, and subsequently associated with the introduction of the Wenham gas-lamp and with the management of the Sunlight Incandescent Company, has resigned his appointment as Works Manager to the Welsbach Incandescent Gas Light Company. We understand, however, that he does not intend to altogether sever his connection with the gas profession.

At the next meeting of the North of England Gas Managers' Association, which will be held on the 26th inst., it is the intention of Mr. J. H. PENNEY to resign the position of Honorary Secretary and Treasurer, which he has held since 1897. The services rendered by Mr. Penney to the Association have been fully acknowledged by the members, and their appreciation of them has given rise to a suggestion that they are worthy of some special recognition. It is therefore proposed to present Mr. Penney with a suitable testimonial on the above-named occasion; and the President (Mr. Matt. Dunn, of Goole) is inviting contributions towards this object. Mr. Dunn expresses the hope that every member and associate will support the movement, which has the entire approval of the Committee.

Many of our readers are doubtless aware that the health of Mr. W. R. CHESTER, of Nottingham, has lately been such as to cause considerable anxiety. About three months ago, he went to Bournemouth, in the hope that rest and change of air might have a beneficial effect. We regret, however, to learn, as we are sure a large number of our readers will do, that this has not been the case. On the contrary, since Mr. Chester's return, a few week's since, the cause of the illness from which he is suffering has been pronounced to be the formation of a tumour upon the brain. It is unnecessary to dwell upon the seriousness of such an affliction. We need only offer our sincere sympathy to Mrs. Chester in the painful experience through which she is passing, and express the hope that she may be endued with all the strength which, in the circumstances, she so greatly needs.

An interesting ceremony took place at Amiens on Easter Monday, when the Resident Engineer and Manager, M. VACHER, who had been for 34 years head of the works of the European Gas Company, Limited, there, bade farewell to his staff. The Directors of the Company, whose solicitude for the members of the staff is so well known and appreciated, delegated Mr. W. B. Brady, the Assistant-Secretary, to represent the London Administration; and he presided at a luncheon which was attended by about a hundred of the staff. They had been invited by M. Vacher, in order to afford him an opportunity of thanking them for a bronze statuette and an address with which they had presented him some days previously, when he was unable to express as he would have wished his appreciation of their kindly sentiments towards him. In the course of his remarks in acknowledging the gift, he said: "The Company is essentially a maternal one, and I could give you many instances of its kindness to its numerous staff. It is a pleasure to serve such a Company; for one derives therefrom honour and profit, as the Directors know how to reward generously those who have worked well for them." Mr. Brady, on behalf of the Company, assured M. Vacher of their gratitude for the services he had rendered during the past 34 years, and expressed their regret at the loss from active duty of so valued a servant. He stated that he was very pleased to have been chosen to represent the Company in France—a country for which he had a particular affection—and to be able to put on record the high esteem in which M. Vacher was held by his chiefs and the staff. Dr. Peugniez, in well-chosen words, made a sympathetic reference to M. Vacher, on behalf of his friends present and absent. M. Vacher proposed the health of the Directors and the Secretary and General Manager (Mr. Williams); and the proceedings terminated amid enthusiasm.

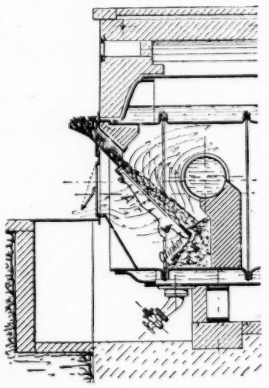
NOTES.

An Improvement in Automatic Gas-Lighting Devices.

Automatic gas-igniting devices are based on the fact that finely-divided platinum has the property of lowering the temperature of ignition of a mixture of gas and air. Usually a pellet of meerschaum or similar refractory material is permeated with platinum black, and some fine platinum wires, which take up heat from the platinum black until they reach the temperature at which the gas ignites. But some time elapses before ignition actually occurs, and the pellets are very brittle. A new method of producing an igniting arrangement, which aims at overcoming these faults of the ordinary pellets, consists in igniting a skeleton formed of an alkaline or rare earth, saturated with a mixture of platinum chloride, platinum cyanide, and silicic acid. The chloride yields on ignition platinum black, and the cyanide ordinary metallic platinum. Thus the two requisite forms of the metal are produced at the one operation; while the silicic acid admits of the skeleton being formed, like mantles, with a large surface, but of great strength. These ignition devices are said to light the gas quickly and surely.

Kuhn's Inclined Furnace Grate.

A new system of firing, which is said to have given good results, has been designed at Kuhn's engineering works at Stuttgart. The characteristic feature of the system consists of an inclined grate—the inclination of which varies with the kind of fuel used. The latter is brought on to the grate by means of a charging hopper, which occupies the full width of the grate. The coal slides downwards on the inclined grate automatically, as the combustion is proceeding; while the flames are forced by baffling walls or tubes to pass over the unignited coal on the upper part of the grate, whereby it is heated and gasified before it slides down into the zone of combustion. The draught can be regulated as required, with the result (it is reported) that there is complete combustion of the gas formed. Thus no smoke and soot are produced, and no fuel is wasted. This smoke-consuming system is said to have been in use for many years at several works in and around Berlin.



A Novel Producer-Gas Plant.

The "Schweiz Bauzeitung" announces a novelty in power-gas plant. In water-gas manufacture, producer gas is made, which, with a rising temperature in the generator, contains increasing quantities of carbonic oxide, which has hitherto only been utilized to a small extent. For about three years a firm at Fürstenwald has used this producer gas, which has an average heating power of 22 calories per cubic foot, for driving gas-engines. The firm has, after much difficulty, succeeded in so arranging an experimental plant, that the gas-engine produces its own gas, by drawing in steam and air through the generator, and then passing the producer gas through a condenser, purifier, and governor. Experiments with a 10-horse power gas-engine were so satisfactory that it was decided to equip a new electrical works at Hensy, near Verviers, with similar suction plant for driving two engines each of 75-horse power. This plant has been working perfectly satisfactorily for about a year. Economically, it is an improvement on plants of older construction, as the boiler and gasholder are dispensed with.

COMMUNICATED ARTICLE.

FUEL GAS FOR DOMESTIC USE AND SMALL TRADE PURPOSES.

By Thomas Fletcher, F.C.S.

[First Article.]

In some rough preliminary experiments with this, one point which appears to have been entirely overlooked as regards effective duty in practice, is the well-known fact that, in the absence of a regenerator, the useful duty is in direct proportion to the difference between the temperature of the flame and that of the object heated. In boiling water, the duty comes out very near to that stated by the advocates of fuel gas. The same work done by 10 cubic feet of coal gas can be equally well done by about 40 cubic feet of Dowson gas, with the same burner; the only difference being in the bore of the gas-jet. A properly proportioned atmospheric burner for coal gas, when the gas outlet is enlarged to the correct size, makes a very satisfactory burner with the lower quality, for many purposes. Owing to the lower temperature of the fuel gas-flame, the proportionate duty for higher temperatures does not hold good; not only for the reason stated, but also that a great loss is incurred by the higher temperature to which the much larger percentage of inert gases have to be heated, and then thrown away. A long series of experiments, which I hope to be able to complete, will be necessary to determine the basis on which calculations of cost can be made. From the result of a rough preliminary test, it would appear that to heat an iron plate to 600° Fahr. the work which can be done with $3\frac{1}{3}$ cubic feet of 18-candle gas, requires about 35 cubic feet of Dowson gas made from anthracite coal, under the same conditions. How this will work out when both gases are used with an air-blast remains to be seen; but from theory, it would appear that the proportions will remain the same. This test is open to suspicion; the result may prove to be too low. The apparatus was new; and it is possible that the water in the holder tank was still absorbing carbon monoxide, thus reducing the heating power. But further experiments with carefully and freshly made gas, after the holder had been in work some time, show the duty available to be extremely low. After several trials, a blowpipe was selected and adjusted to give the highest temperature with Dowson gas. With an air pressure of $1\frac{1}{4}$ lbs. per square inch, and a gas pressure of 4 inches on the holder, the consumption was at the rate of 180 cubic feet per hour; and this flame melted a thin rod of cast iron, backed with fire-brick, in two minutes—gas consumption, 6 cubic feet. With coal gas, and a blowpipe equally well adjusted, with a gas consumption of 60 cubic feet per hour, the same blower being used, the same rod was melted in fifty seconds—gas consumption $\frac{5}{6}$ cubic foot. The Dowson gas thus required seven times the quantity, and more than twice the time, as compared with coal gas. This, in practice, would show no economy with the poor gas, though the latter was assisted by the high pressure at which it was delivered. For blowpipe work, the air pressure is practically limited; a higher pressure blows the flux and solder away, and disturbs light work. The test of plate heating is only given to show the ease with which errors can be made, the great caution necessary to obtain reliable results, and to call attention to a very simple test by which any user can closely estimate the heating power of any gas. This will be mentioned in due course.

In heating enclosed spaces, such as cooking ovens, japanning, core-drying stoves, and similar work, the gas required can only be determined by experiments. These experiments will be made with ovens, and with metal melting furnaces, &c., so that actual working data and costs can be determined. It is rather unfortunate that these were not made years ago, as, from the one recorded above, it would appear that the so-called "cheap" fuel gas will, for many purposes, prove to be very costly in practice; and the feared competitor to coal gas will only prove a bogey and a shadow. Personally, I am much disappointed; as, for larger work than is usually considered to be within the scope of the apparently expensive coal gas, I hoped to be able to fill a great want. It must be clearly understood that all forms of regenerator are excluded. These are bulky and expensive, and are not at present applicable in practice to the requirements of users whose work lies between the range of coal gas and the large installations where bulk and special attention are of secondary importance. One difficulty in testing the comparative costs of fuel gas and coal gas in practice is, that where the former is used there has been no apparatus for testing the actual cost of any one operation; and if it is used on a very large scale, the cost of what is considered small work is not taken into consideration. If the fuel gas is ever distributed for general public use, for domestic and small trade purposes, it appears likely that coal gas, notwithstanding its high initial price, will prove the cheaper fuel in practice.

With regard to the purposes for which the higher duty can be obtained—boiling water, &c.—the experiments were made under precisely the same conditions with the different gases, in a small but well-ventilated room; the outlets being at the highest point in the roof. As with coal gas, the vessel containing the water was in contact with the top of the flame; and this means that some of the gas escapes unconsumed—more than with coal gas, as it is much more easily extinguished by contact with any cold substance. There is no doubt whatever that the effect of this unburnt gas is very unpleasant; and the question arises to what extent the unpleasant, if not unhealthy, effect takes place when coal gas is mixed with water gas. There is no smell when Dowson gas is partially burnt; but there is a very unpleasant effect if used in a room. It can be prevented, of course, by lifting the vessel out of the flame; but this means a much smaller duty for the same consumption, and it would appear that the figures given, and accepted, from theory, of 4 to 5 cubic feet of fuel gas being equal to 1 cubic foot of coal gas, will have to be very seriously revised, and that for some purposes the consumption of the poor gas, in actual work, will be nearer ten than four times that of coal gas. The special plant which has been erected, has been designed to test this matter under all conditions; and the results will be of the greatest importance.

It must be clearly understood that, in these preliminary notes, I have departed from my usual custom of never publishing any figures or results which I am not prepared to prove to be absolutely correct. The remarks are based on rough experiments, which may or may not be exact; but they are, at the present time, of serious importance, and the suggestions may be useful to those who are experimenting, or intending to experiment, in the same direction. We have for many years been making special apparatus to be used with fuel gas, but have never attempted to guarantee the actual duty and cost in practice. Up to the present, it would appear that coal gas is likely to hold its own position at the top, both for heating and lighting, in competition with either fuel gas or electricity. It may be also of interest to mention that we have made for some time past small electric furnaces for enamelling; but the cost of working these is quite prohibitive when cost is of any importance.

The figures given refer to Dowson gas; but as this is, on the average, rather better than Mond gas or any of the producer gases, it may safely be taken as a standard of reference. Dowson gas, properly made, burns well with a clear blue flame, which will heat thin iron wire to dull redness. Some of the fuel gases will not burn at all unless previously heated; and I note in one patent for using the Mond gas for incandescent fires, an arrangement is claimed for heating the gas before burning, by placing a coil of the supply pipe where it is surrounded by waste heat. This may be an improvement; but it means complication and expense.

There is another question which will have to be decided some time; and the sooner the better for all concerned. When water gas is carburetted and mixed with coal gas for general distribution, does this mixture become extinguished at a lower temperature than coal gas alone; and, if so, what proportion of carbon monoxide escapes unburnt when a vessel of cold water is placed in contact with the flame, as it is at present with coal gas? Judging from theory only, it would appear that the results, as regards the atmosphere of the room, would be practically the same as with coal gas alone; but the matter should be proved by a careful and reliable analysis of the products of combustion—theory only should not be relied on. I should have been pleased to take this matter up, but for two objections. Our apparatus is designed to produce Dowson gas only, which is essentially different to water gas in its composition and behaviour; and the experiments must be carried out by someone who is an authority on the subject, and who has no interest in, or connection with, the commercial side of the question—there must be no shadow of suspicion of any bias or commercial interest in the results.

Where a diffused heat is required, which is very rarely the case, no doubt any of the producer gases will give a fair duty as compared with coal gas; but for small work and small industries, the greater part of the work to be done is local—confined to a small space. With producer gases, more than two-thirds of these, and of the air supply required, are inert—they simply enlarge the flame, and lower its temperature, giving a diffused heat of the same total power, less the loss entailed by heating the inert gases, and also by spreading the heat where it is not wanted. The reverse of this result may be seen in the very high duty which can be obtained by burning coal gas or hydrogen with oxygen. The total heat evolved is the same; but the duty obtained in practice, where an intense rather than a diffused heat is required, is enormous. The difference may be compared to the results obtained by dry charcoal in a furnace, and this same fuel saturated with water. The theoretical duty is the same in both cases; but the useful work done is very different, unless the required temperature does not exceed the boiling point of water. Where this is the case, the steam will give up a portion of the duty which would be otherwise wasted.

Although fuel gas made from anthracite coal appears to be better than the average in quality, it is evident that it varies considerably, and probably will do so with most generators. No experiments will be of any value unless checked by some standard—such as boiling a specified quantity of water in a vessel of standard shape and size. This is an easy and sufficiently exact method of comparing different samples of gas, and must be repeated as a check to every experiment. It is clear that the useful limit of temperature available is comparatively very low. I have before me a report of an intending user of fuel gas for metal melting, in which it is plainly stated that after a considerable number of trials, with an unlimited gas supply and powerful air compressors, it was found impossible to obtain, in a crucible, a temperature higher than would melt ordinary brass. As usual,

no figures were available; but it was mentioned that the consumption of gas was "enormous." In the same furnace, which is made of a special non-conducting material, an ordinary atmospheric flame with coal gas, without air under pressure, would do this work easily. There are thousands of comparatively small metal workers who would be only too glad to do their melting with a cheap fuel gas if it were possible. Judging from the appearance and temperature of the flame of the gas from anthracite, with the Dowson producer, it would appear that results may be obtained with this which are impossible with gases made by any other fuel or generator; and if this proves to be the case in practice, as 1000 cubic feet of Dowson gas can be made from 13 lbs. of anthracite, or 8000 cubic feet from 1 cwt., it is possible that the outlook for the Dowson gas for high temperature work may be better than appears likely for any of the other fuel gases.

Some tables I have before me give the combustible gases as:

Siemens producer	. . . .	28 per cent.
Mond	,, ...	38 ,,
Dowson	,, ...	44 ,,

But it must not for a moment be supposed that these are the actual comparative duties obtainable, though this may be the case under some conditions. For instance, Dowson gas contains 56 per cent. of inert gases, and Siemens gas 72 per cent.; and a larger proportion of heat is wasted in heating up the inert portion of the latter, only to be thrown away. For this reason, the vanishing point of useful duty is much lower; and above a certain point (yet to be determined) an unlimited supply of gas, used in a battery of blowpipes with an unlimited air pressure, would actually cool a furnace, if the temperature is above a certain point. It is therefore clear that, if a fuel gas is to be supplied for general purposes—domestic and small manufactures—it will be quite as necessary to create a legal standard, as with coal gas; and unless this is done, it will be easy to increase the working cost to the user to double or treble what it should be. This analysis and guarantee means examiners, testing-stations, and incidental expenses, which would make a "cheap" fuel gas a more doubtful matter than it is at present. One maker of producer-gas plant strongly recommends gas—made, of course, with *his* producer—for firing steam-boilers. I should very much like to see a reliable test of this, as compared with ordinary slack or burgy, for working costs (say) for one or two months running. I believe I am correct in saying that Mr. J. Emerson Dowson has stated in the plainest possible language that steam-boilers cannot be fired economically with producer gas.

TECHNICAL RECORD.

NEW ENGLAND GAS ENGINEERS' ASSOCIATION.

(*Continued from p.* 889.)

Mr. C. J. R. Humphreys, of Lawrence (Mass.), submitted a report from the Committee appointed at the last meeting to deal with the various uses of gas. He said that the gas-cooker continued to grow in favour, and that the use of gas both for house furnaces and room stoves or fires was on the increase. In some cases, special attention had been given to the placing of room-warming stoves in lodging houses. Gas-engines up to 10-horse power were used for general trade purposes. Gas was used for heating fires, in laundries, for brazing, annealing, and tempering; for hot water in barbers' shops and elsewhere; for type-setting machines; and by dentists and bakers. In concluding, he asked the members to keep close records of the various uses of gas, and to supply his Committee with full details.

A paper on "Some Details in the Operation of a Water-Gas Plant" was read by Mr. Chas. F. Leonard, of Fall River (Mass.). It was important that the temperature of the chequer-work in the carburettor and superheater should be suited to the quality of the oil used, so as to avoid deposit of lampblack on the one hand, or an excess of tar on the other. There was an ideal gradation of heat for every quality of oil; and he argued that this ideal was more nearly approached with short than with long runs. If at the conclusion of a run a very marked reduction in the temperature of the chequer-work was observable, it would be well to try shorter runs. A common method of judging heats was by the naked eye; but the blue-glass pyrometer, as described by Mr. Jones at the 1900 meeting of the American Gas Association, was better. He was using gas oil and broken anthracite in double superheater type machines. After the set had been some time in use, the heats were raised, because as the carbon deposit formed on the bricks it concealed to a certain extent the true temperature; and therefore it was necessary to get a higher result by the blue-glass pyrometer to maintain the same actual temperature. The importance of attention to this point was shown by the fact that lately, for several months, he obtained a higher candle power per gallon of oil to the extent of 10 per cent., entirely through the closer approximation to the ideal temperatures rendered possible by the use of the pyrometer. The oil spray should be evenly distributed over the entire cross-section of the carburettor, as if it fell in one particular part, a local reduction of temperature would be caused. The chequer-work should be carried up to the level of the top manhole; so that it can be seen from outside, and the temperature estimated. If at a lower level, there was also a risk of insufficient fixing of the gas. Using ordinary 9-inch bricks, he spaced those in the carburettor 2 inches apart, and in the superheater 1½ inches apart. If the superheater became too hot, it was not easy to cool it down, and therefore he inserted a 1-inch steam-pipe at the inlet to the superheater, and a second steam-pipe half way up. In this way, he was able to save time and oil, and greatly assisted as regards uniform candle power. The length of blow depended upon the condition of the fire, the blast pressure, and the heat required. With high blast pressure, there was a tendency to overheating of the superheater; and he preferred to partly close the blast-valve, rather than diminish the speed of the engine. Heats could be more quickly raised under a high blast; but after a good heat was obtained, it might be necessary to blow through the generator only for 2 minutes in order to get the fire into proper condition. This was a loss of coal; and, as a rule, he preferred to go on as soon as the heats were up. The differential gauge, showing the difference in pressure between the bottom and the top of the fire, was a convenient index of the condition. He usually ran 9 inches; but there was a tendency to cut this to 6 or even 5 inches, particularly with light fuels, such as coke. With a high blast head, the fire would give longer runs; but the make would drop faster, and there was a larger variation according to the quantity of clinker in the furnace. With a lower head, the runs were smaller; but the make was more even, and the intervals of clinkering could be longer. On starting after cleaning, the make was at a maximum, and gradually fell until the next cleaning time; and as the make fell, it was necessary to proportionately reduce the supply of oil. The station meter, and photometer readings from the relief holder, afforded information as to the regulation of the oil supply. In an 8 ft. 6 in. set, he usually charged about 1200 lbs. of anthracite every four runs, each run being 8 minutes, and clinkered every twelve hours. By slightly stirring the fire, &c., he could make it go for fourteen or fifteen hours when necessary. The average time for cleaning a furnace was 70 minutes. The oil was stopped two minutes before the end of a run, and the steam reversed half-a-minute before the end of a down-run. It was a good plan to lay on steam connections to the bottom of the waste-box, the inlet of scrubber, and the condenser; so that these points could be warmed up when starting—thus avoiding injury to the quality of the gas. The consumption of oil, and the quality of the gas made, were the best indications of the working. The colour of the gas was also a rough test. At the bottom sight-cock of the carburettor, it should be bluish; at the bottom of the superheater, a bluish brown; and at the top, a darker shade of brown. Tests for proportion of carbon dioxide, which could be quickly taken, were valuable as a guide to the proportion of steam. The percentages of carbon dioxide in the finished gas should not exceed 3. He used a 60-inch bar, with Edgerton stardard, for a quick test of candle power. Any accumulation of carbon in the carburettor or superheater could be burnt out by the blast; and it was in connection with this operation that the steam cooling pipes would be useful. He found the outlet pipes required cleaning every three weeks, and that the chequer-work could be run for three months without renewal. It paid to err on the side of cleaning too often than the reverse. All valves must be kept in sound condition; and there were a large number of other details, affording opportunity for a wide range of opinion and practice, and a very fertile field for investigation.

Mr. J. J. Humphreys, jun., opened the discussion. He suggested, from the figures before them, it would appear as if good results could be obtained by longer runs and more frequent clinkering. It was possible to start a new set in such a way as to avoid the necessity for steam. The make of tar could be readily gauged from the outlets. Mr. Africa said he got over 6⅓ candles per gallon of oil in the summer; but only 5½ in the winter. Using an old-style apparatus, with a superheater 30 feet high, he had found it an advantage to take out some of the chequer-work; and this avoided the necessity for steam cooling pipes. He used a relief holder; and made 26 to 28 candle power gas. Mr. M'Kay understood the author to claim that, with the double superheater set, the highest temperature was at the top of the carburettor, and that the gas, after passing this point, met with a gradually decreasing heat. That was not really the case, as the temperature increased until perhaps one-third up the superheater. A sight-cock could be put in at any part to enable the temperature to be examined. One important point was the temperature of the oil on admission to the carburettor; and it was desirable that it should be previously warmed. It appeared to him that the author tested the quality of his gas before it was completely condensed. He criticized the use of the steam cooling pipes, and thought they could be dispensed with. He preferred to regulate the blast by the speed of the engine rather than by the blast-valves. Then the author showed a wide decrease in the make per run, from 18,000 to 10,000 cubic feet. He gathered that the fixing surface was large in proportion to the make, which would help to keep the set clean. He could not quite see why the quality of the gas should suffer when starting a set. With a high blast, there must be sufficient air supply, or the result would be a waste of combustible gases. Mr. A. B. Slater, junr., had given some attention to the heating of the oil, and found there was not much advantage in having the temperature at the inlet over 200°; and the oil should not be heated by the gases from the superheater. The difficulty in the quality of the gas at starting could easily be got over by regulating the supply of oil to the first heat. Mr. Barnum

had compared coke with anthracite in the generator, and found that the advantage was in favour of the anthracite to the extent of 1 lb. per 1000 cubic feet of gas; and the daily output was 16 per cent. more.

Mr. Leonard, in replying, said he used a Collins oil-spray, also a small round valve with four holes, to throw the oil to the circumference. The condition of the fluids in the overflow outlets was not, he thought, a very reliable test. He did not see that better results would follow more frequent clinkering, as, although his make varied, the supply of oil could be regulated accordingly. His results were similar to those named by Mr. Africa. The tests of illuminating power taken in the generating room were only comparative working tests. When he had to use steam for cooling, it was once in three or four runs; and the quantity required varied according to circumstances. He used 8-minute runs and variable blows, 6 to 10 minutes, but as near 7 minutes as possible. The first blow was for 15 to 25 minutes. Reducing the opening of the blast-valve had the same effect as slowing the engine; but it might not be desirable to check the engine if it was supplying more than one machine.

Mr. A. B. Slater, junr., of Boston (Mass.), introduced, as a short topic for discussion, the various methods practised in the treatment of coal gas, with special reference to deposition of naphthalene. In Europe, there was a fair degree of uniformity in this respect; but in the States things were different, and in some of the older or smaller works the treatment was very inefficient. Even good and well-designed apparatus might be spoilt by being used under conditions different from those intended; and it did not need a very biassed or incompetent person to make good apparatus go wrong. While the word "condensation" was generally supposed to signify the removal of all undesirable vapours, some appeared to regard it as merely a cooling to atmospheric temperature. The truth was that the first named was the real object sought, and the cooling was merely an incidental matter. The particular duty of the condenser was the removal of the excess of hydrocarbons—always bearing in mind the fact that the lighting value depended upon retaining a proportion of these in the gas, and carrying them to the consumers' burners. The composition and properties of the various hydrocarbons were considered in detail. The author advocated the removal of the heavy tar at a high temperature, by means of an apparatus such as the Pelouze and Audouin condenser, a fan exhauster, or a centrifugal extractor. If the gas was too cool in passing this apparatus, trouble from naphthalene would follow; and the illuminating value of the gas would suffer by the absorption of hydrocarbon that should remain in the gas. Not only the gas, but also the tar, must be of sufficient temperature, as cold tar very speedily chilled the gas. After the removal of the heavy tar, the reduction of temperature should be very slow and gradual; and under such circumstances, the gas would remain practically permanent. In the course of a long series of experiments with a Pelouze and Audouin condenser, he found that the formation of naphthalene or otherwise could be practically controlled. Any apparatus that added aqueous vapours to the gas was likely to cause trouble. The slow cooling necessitated large area and size of apparatus when air was depended upon. But, by subdivision and the use of water as the cooling medium instead of air, smaller areas would suffice; and according to his experiments, most of the water coolers in use did not carry the subdivisions far enough. There should be a larger number of tubes; but they might be shorter. After the heavy vapours were removed, the gas might with advantage be washed with strong liquor containing an excess of free ammonia before entering the water cooler; and the gas should at once be gradually reduced to the lowest temperature likely to obtain in the district. He advocated fairly high heats, retorts charged sufficiently heavily to reduce the air space above the coal and increase the velocity of the gas in travelling from the retort, ascension-pipes of ample size with easy bends, not too short nor yet too long. The tar in the hydraulic should be kept moving, and flow off as fast as it was formed, and the hydraulic be shielded from chills or cold wind. He preferred ammoniacal liquor rather than fresh water for making up the seals in the hydraulics.

Mr. Prichard opened the discussion. He said that he had been working on similar lines, and his experience fully agreed with that of the author. It was remarkable that, although Dr. Bowditch published a book on condensation in 1867, and the principles concerned had been repeatedly brought forward since, some 50 per cent. of the plants running to-day were robbing the gas by allowing it to come into contact with cold tar. He would like some information as to the aqueous vapour in the gas, both before and after the Pelouze and Audouin condenser. His new plant, which proved very satisfactory, comprised, after the hydraulic and exhauster, a 3-chamber Walker's tar-extractor, in which the gas was treated at a temperature of 115° to 120°, then a water condenser, and next a standard scrubber. At the outlet of the tar-extractor, the gas would be about 90°; and in the condenser it would be cooled to 65°. It was raised again to about 70° at the inlet of the first purifier. He was saving over £1000 a year by keeping the gas from contact with cold tar. He described, with the aid of a drawing, a simple self-acting expansion outlet trap for the water in the multitubular condenser that would take care of itself within a few degrees. The author seemed to think that the Walker tar-extractor, or any immersion extractor, would add aqueous vapour to the gas. He found that the gas at the hydraulic outlet was saturated, as was that at the tar extractor outlet. It was nearly saturated until it passed the purifiers, at the outlet of which it showed 85 per cent., and at the governors 75 per cent. of saturation. To put it another way, the tar-extractors took out 31 per cent., the condenser 50 per cent., the scrubber added a little, and the purifiers took out a little. He would like to know if the friction extractor removed a larger proportion of aqueous vapour than the immersion extractor. Mr. Addicks asked if he was correct in assuming that benzol in the gas held a certain proportion of naphthalene in solution, and conveyed it safely to the burner; and, if so, what degree of reduction in temperature would be necessary to cause a deposit of naphthalene. Mr. Wood strongly approved the paper, as condensation was generally neglected, and the thermometer was not used as it should be. He had recently been comparing the apparatus in two modern German works; and though there was no marked disagreement in methods or arrangement, he observed that in one works the area of the atmospheric condensers was 4·7 square feet per 1000 cubic feet per twenty-four hours, and in the other 7·5 square feet, which showed some disagreement from a theoretical standpoint. They must all agree that the proper arrangement was atmospheric cooling in large areas with slow velocity, followed by friction, baffling, or filtration at a higher velocity, and then water cooling, so adjusted that the difference in temperature between the in-flowing water and out-going gas should be just sufficient for the work and no more; and this condition should be maintained throughout the whole length of the water cooler. That was the ideal condition, and the closer they could approximate to it in practice the better the results. One difficulty was the changes of atmospheric temperature, which in New England might range from 80° at noon to 32° at midnight; and conditions suitable for one extreme would not do for the other. Adjustment should be made to suit the changing atmospheric conditions; and this led to the suggestion that the multitubulars should be divided into a number of units, any of which could be put off or on as occasion demanded. If the ammoniacal liquor used for the scrubber was drawn direct from a hot well, it might be too warm; and he found a decided advantage by first passing it through a cooling apparatus. The water in the gasholder tank was useful for this purpose. He found the sub-division of the air condenser also a great help in meeting variable conditions of make and temperature. Mr. Barnum noticed that the author claimed that the olefines were the most valuable hydrocarbons. He thought the value of a hydrocarbon constituent depended upon the ratio of the total carbon to the total hydrogen and carbonic oxide in the mixture. A gas with a high proportion of hydrogen would give better results with acetylenes, and one low in hydrogen, with paraffins instead of olefines. When used alone, the acetylenes gave the highest candle power. Then it was stated that the illuminating value of a gas was largely due to benzol and other easily condensible vapours. But coal gas did not contain over 1·2 per cent. of such vapours after condensation; and Mr. Miller had found that they seldom exceeded 2 per cent. in 30-candle water gas. In England, it had been found that washing out the vapours with heavy oil only reduced the quality some 2 candles; and at best he did not think that more than 4 candles could be ascribed to the vapours. He also thought there was some confusion between the percentage of vapour in the gas and the vapour tension. He would like to know at what temperature the gas should leave the water condenser, as compared with the prevailing atmospheric temperature. What was the critical temperature of the naphthalene, and the necessary resultant vapour tension of the absorbents that would hold it in suspension. It had been found at Worcester (Mass.) that there was an intimate connection between average atmospheric temperature and naphthalene complaints. When the temperature was about 50°, they had trouble from naphthalene. To further check this question, he had ascertained, from the amount of liquor taken out of the drip boxes in the mains, the fall of temperature experienced by the gas after leaving the holder; and he found the average temperature in the mains was 49°. Some tests made at Boston showed the average temperature of the earth, 3 feet below the surface, to be 48°. This showed the average critical temperature of the naphthalene carried by the gas in the mains to be about 50°. The point was, how was the temperature to be arranged or regulated as the outlet of the condenser, so that the gas, when it fell to this limit of temperature, would not deposit naphthalene? It must be remembered that in the holders the gas would become saturated with aqueous vapour at the atmospheric temperature, whatever that might be. The author stated that, with a minimum of water vapour and a proper resultant vapour tension, the naphthalene would take care of itself. But to do this, the naphthalene and water vapour must stand or fall together; and how could this be secured? So the question stood thus: Should the gas be cooled below the critical point at the outlet of the condenser, or should there be a safe margin above the critical temperature, in which case there would be no trouble in the summer, some difficulty in the spring and fall in the distributing system, and the holder would take care of it in the winter." The first suggestion meant trouble at the condenser, and the second occasional trouble only in the district and holder connections, which could be greatly reduced either by washing the gas with heavy oil to take out the naphthalene, or by adding a suitable absorbent vapour, or by both schemes. Mr. J. J. Humphreys, junr., said that if there was not a centrifugal extractor on the market, the cream-separator people could make one that would throw out hydrocarbons to any desired extent. It would depend upon the peripheral speed. He did not think that it was

possible to leave naphthalene in the gas and never have any subsequent trouble with it. If it was not economical to remove the naphthalene, they must put up with occasional trouble. Mr. Africa wished to know something about the effect of pressures. If gas at 2 inches pressure would carry a certain quantity, how much would it carry at 8 inches? If gas were sent out at 8 inches pressure, would the reduction to 2 inches in the mains assist it in resisting the effects of a fall of temperature? He was struck with the fact that there were no deposits of naphthalene in connection with distribution at high pressure. The Secretary understood that it was stated that the high-pressure system was free from trouble at a time when stoppages were frequent in the low-pressure system in connection with the same works and make of gas. The President said he would like to hear more about the connection between aqueous vapour and naphthalene. Mr. Bremond, after elaborate investigations, was a great believer in desiccating the gas; but others had shown that aqueous vapour had nothing to do with the deposition of naphthalene. He found that, by using a certain proportion of naphtha and heavy oil in a "Standard" scrubber, naphthalene could be removed without loss of candle power. But if tar was present, there would be trouble.

Mr. A. B. Slater, junr., in replying, said that the action of the Pelouze and Audouin condenser, as regarded water vapour, depended on the temperature of the incoming gas. If the gas was very hot, the effect would be *nil;* at 120°, there would be a slight reduction; and at 90°, a considerable removal of water. There was a very common idea that gas should not be cooled below 60°; but it was a mistake. This limit was too high for many conditions of distribution. In some cities, the gas was exposed to temperatures below zero; and a limit of 60° was too high for that. The gas should be reduced to the lowest temperature that it would be likely to meet with subsequently. Any sudden cooling, however, would cause the deposit of vapours that would remain in the gas under more careful treatment. Assuming a gas saturated with naphthalene to be cooled to 60°, then a subsequent reduction, however slight, would cause a deposit. All hydrocarbon vapours would carry a certain quantity; and the carrying power decreased with reduction of temperature. But it was rather difficult to state at what temperature the trouble might be expected to commence. In Europe, the condensers were usually out of doors, and were therefore subject to the vicissitudes of atmospheric changes. The Pelouze and Audouin condenser could not be applied to increase the proportion of aqueous vapour, as could be done with the immersion type of apparatus. The chief objection to it was the liability to clog, which was entirely a question of temperature. Of course, it should not be so close to the hydraulic as to admit of lampblack or pitch being carried over into it. With very hot tar there was never any trouble; and he believed in admitting the gas at not less than 140°. The hot tar would remove naphthalene, though it would not touch the illuminants. Acetylene alone had a high candle power; but it was not so successful for enriching as benzol, which was now very largely used in Europe for that purpose. Acetylene was quite soluble in water. The conditions of distillation were as important as those of condensation in connection with naphthalene trouble; and the whole moral of the thing was—make as little as possible, and send no more into the mains than the vapours can handle. He had tried some experiments with the centrifugal separator, and found it affected the illuminating power considerably. The heaviest vapours were brought into contact with the tar at the periphery. In any case, the machine would have to be run very hot; and he doubted if it would prove a success. In all cases he had found that hot gas was practically saturated with aqueous vapour. A gas saturated with vapour would always form a deposit on being cooled. Within small limits, he thought the effect of a reduction in pressure would tend towards retaining naphthalene in the gas. The explanation of the freedom of the high-pressure system from naphthalene trouble was simply that the naphthalene was precipitated by the act of compression. Unusually high heats, and retention of the gas in the retorts, increased the proportion of naphthalene.

(*To be continued.*)

RECENT DEVELOPMENTS IN INCLINED RETORT PRACTICE IN THE UNITED STATES.

A paper with this title was presented at the Eighteenth Annual Meeting of the Ohio Gaslight Association, held at Columbus on March 19 and 20. The author was Mr. Frederick Egner, a letter from whom, on the same subject, appeared in last week's "Journal," p. 897.

After a few preliminary remarks, Mr. Egner said: Doubtless you all have kept up with the subject—one of such importance in the economical production of coal gas. May I then ask your consideration of the earlier history of the inclined retort in this country? It will no doubt clear the way in answering the pertinent question, "If the inclined retort system is all that its advocates have claimed for it, why has it not been more generally adopted in this country?" It is not yet fourteen years ago when the first bench of inclined retorts was erected and successfully operated for over two consecutive years at the works of the St. Louis (Missouri) Gas Company. It was a single bench of five D shaped retorts, fired by an ordinary ground-floor furnace. The results were such that the President and the Engineer of the Company were well satisfied with it; and this led subsequently to the erection of a stack of eight benches of seven retorts each, at what had in the meantime become the Laclede Gaslight Company of St. Louis, Station "B." These were a failure; and to that failure may be ascribed, in my opinion, all the hesitancy by American gas men to adopt that now well authenticated successful system.

There were several other failures of the inclined system about the same time. At Springfield (Mo.), at Washington (D.C.), and notably at the Kensal Green station of the Gaslight and Coke Company, at London, England, where an installation of over 450 retorts was abandoned for similar reasons as was that at Laclede—as the Chief Engineer then and now, Mr. Trewby, himself told me some years later. The causes of failure were almost immediately known, and in foreign countries, remedied, and the work resumed. But with us it was different, as you all know.

The causes of the failure include some which it may be well to remember now, to guard against falling into a like error. We did not, for instance, take measures to prevent the retorts slipping forward into the fire-room. We discussed the possibility of it. But "as they did not do it in France," we let it go at that; and the retorts slipped, and, in slipping, destroyed the recuperators of the benches, pulled away from the upper mouthpieces, got badly cracked, and so forth. The cracks were stopped the same as one would stop cracks in any horizontal retort; and just as effectively. The destruction of the recuperators did not affect the operation of the benches to a prohibitive extent; and the slipping stopped of its own accord. But the sad mistake we made was that we tried to introduce other fancied improvements of our own; and at last some miscreant placed an explosive under the exhauster, blew a hole into it, and thus our trial with the inclines was stopped. It was the last incident which may have induced their (the benches) being torn out, and replaced by several good sets of water-gas apparatus. I do not know if that was the case; but I do know that our President had determined to spend no more money on the inclined retorts, and he being, as I gladly testify he was, an able gas engineer, and generally highly esteemed, that put an end to inclined retorts for the time being in this country. Everybody after that hesitated to employ what was well known to have been a failure. And then others interested in other methods took up the subject, and did not help the cause of inclined retorts much, as everybody knows.

To-day the inclines are firmly established. Eminent foreign and some American engineers have become convinced—after seeing them as I did, in foreign countries—that they are a great improvement on the older method. The system has therefore been adopted extensively abroad, and is being operated on a pretty large scale in this country even now, and more is to follow soon. The latest installation is at the works of the Consolidated Gas Company, at East 138th Street, New York City, under the able general supervision of Mr. Wm. R. Beal, now President of the American Gaslight Association, who, though long since past the grade of Superintendent, still seems to take a personal interest in the subject, in which, as he has told me, he thoroughly believes. His efforts are ably seconded by one of his assistants, Mr. Burgi, a Swiss engineer of many years of practical successful retort-house experience; and I think we may look forward to this last installation in this country to bring about a generally more favourable impression as to the inclined retort system.

The mistakes we made twelve years ago in construction, have been long since eliminated. No one, to-day, would erect inclined retorts without suitably bracing to prevent slipping into the fire-room. No one would ever erect benches back to back, with a space of only about 7 feet between them. This was made possible with us by using long bent mouthpieces, and charging the retorts from the top of the bench. Nobody would think of using them now. Short, flat mouthpieces—so we saw directly after firing our benches—would have been better; and no one uses any others now. If there are any installations of inclined retorts to-day in this country which are not as perfect as they might be, it is because the models perfected years ago—yes, nearly ten years ago—in England and Germany have not been followed; and the mistake has been made, against which I have raised a warning note not to fall into—namely, to try to put untried imaginary improvements into settings of inclined retorts, instead of using tried, well-established models, of which there are now a good many. Many American gas engineers have of late been abroad, and have seen the inclined retort system, and have become at last convinced—aye, and enthused too—by this to any unbiassed judge great improvement in the manufacture of coal gas. That it is comparatively less costly in construction and operation than anything else, the bye-product coke-ovens not excepted by a long sight either, has been claimed, and to my mind proved to be a cold fact.

Such men as Mr. Chas. H. Nettleton and Mr. F. C. Sherman have been very outspoken in favour of the inclined retort system. Mr. C. F. Prichard, who can show one of the best designed, kept, and managed gas-works anywhere, is another. All these contemplate using the inclined retort system. "And there are others," and a good many of them, too.

Let us now take up some of the other questions. "What changes have been made in order to adapt inclined retorts to American conditions?" I do not know that any changes were

necessary. The Westmoreland Coal Company at one time sent a lot of their coal to England to have it used in the inclines, to try and see if the "slip" that some antagonists of the system made much of—without knowing much about it—amounted to anything. The result was most satisfactory. The inclined retort will need no change to adapt it to American conditions. But it will change those conditions very materially in favour of the gas company, its operating officers, and, finally, its stock holders; and it will also greatly lessen the hard lot of the retort-house labourer, for when the inclined retort system is employed, the importance of the brawny fireman will be wiped out right then and there. Anybody can make gas, draw and charge retorts perfectly; and an English gas engineer once said it was no longer man's work—woman could do it. Under reasonably favourable conditions, over 100,000 cubic feet of gas can be produced by one man per day, with less physical exertion than is possible in the old manual labour way to produce 30,000 cubic feet; and certainly less skill is required than with any mechanical stoker I have ever seen. The economy is at once understood.

When operating on a sufficiently large scale to warrant the use of stoking machinery, should you desire to make comparisons, remember that in either case overhead coal-bins and coal and coke conveying apparatus may be and are employed. But, where with (say) 20-feet retorts on the horizontal plan and stoking machines, two sets of bins must be used—one on each side of the house—with inclined retorts you require but one. And while that one must be larger than either of the other two, yet the fact that but one set of elevators and conveyors is required, and but one lot of bins, the whole construction must be simplified and necessarily cheaper, while its effectiveness is not a bit less. And then the cost of the drawing and charging machinery has nothing to compare with it in cost with the inclined retort system, for the simple sheet-iron charging shoots certainly cost very much less in the first place; far less as to subsequent maintenance or repairs; and the retort-house, if you elect to have one, and not do like they do with the bye-product ovens—viz., have no building at all—may be a good many feet less capacity than when machine drawing and charging, now grown obsolete, is indulged in. It is a little amusing to me when I hear advocates of stoking machinery say that inclined retorts are all right in works where stoking machines cannot be employed to advantage, because they are too small; and pretty soon to hear some one else state that inclined retorts are all right for large works. The fact is, they are all right for any works.

This reminds me of a short experience, had not yet two weeks ago, when making an inspection for a banker of a gas plant he thought of buying. It was a pretty good coal-gas plant, but awfully run down. The superintendent asked me what I thought they needed most; and before I thought, the reply came: "You need a knowledge of the gas business; you need experience more than anything else." You know, gentlemen, that a grave mistake is often made in that direction, and that a first-class, well appointed coal or water gas-works may be unproductive, or more so than need be, just because it has come to be believed, in some instances, that to know how to sell gas is everything; all else is so easy. Pardon this short digression. In my opinion, both the salesman and the engineer are necessary, each in his place. But it requires a practical knowledge and training, only to be obtained by experience, to enable one to obtain the best possible results out of a gas plant.

It would certainly be easier to dump a charge of coal into a retort with a wheelbarrow than to lay in a good charge with a shovel. Anybody could do the former, using inclined retorts; but it does require considerable practice to do the latter well with a shovel; and you know that the make per pound of coal is sometimes quite seriously affected by the manner in which the charging of the retort is done. So that works too small to employ coal-handling apparatus, could yet use inclined retorts, and to some advantage. It has been asserted by competent authority, that any coal-gas works making 50 million cubic feet of gas per year would find economy in using coal-handling machinery. This I will not state on my own authority, however; but I do say that the inclined retort system, with a good, simple recuperative furnace, will pay any works to put up, if they have to renew or newly erect benches. As the inclines require less floor space, and only more height than horizontal retorts of like capacity, it will be found that some of the obstacles raised against their use are only imaginary, The first cost of an installation of inclined retorts is not greater, or but little more so, than that of horizontal retorts of like capacity; they require fewer repairs; last as long or longer in consequence; are more easily scurffed; and just as easily patched if such should become necessary.

I have been asked to give any data of operating costs or results which have not heretofore been published. Permit me to say that that is something I cannot do; for the subject of inclined retorts has been so thoroughly gone into, and the facts published, that while it is possible that I have some data not generally known, all has been published. My paper on "Inclined Retorts up to Date," read at the meeting of the American Gaslight Association at St. Louis, in October, 1894, contains figures which, though eight years old, may yet give light to the student of the subject at this present date.

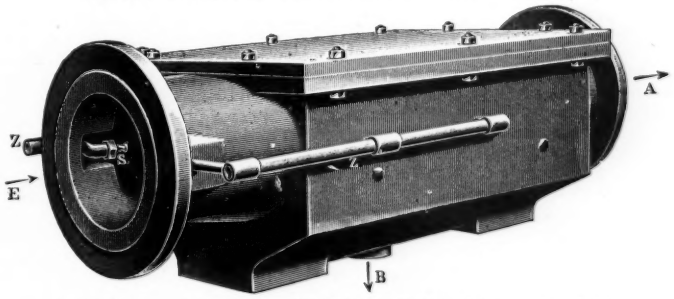
In a brief supplementary paper, Mr. A. H. Barrett said that his working operations, day in and day out, are as follows: The charges are 700 lbs., burned off in five hours. The percentage of coke consumed to that made, is a little over 20 per cent. The stokers are worked in gangs of four men, who draw and charge nine retorts per hour, making 216 draws per gang for twenty-four hours, representing 151,200 lbs., divided among eight men; being four men on each twelve-hour shift, which represents 18,900 lbs. to each man per day of twenty-four hours. As the question of handling coal, and the subsequent delivery and treatment of coke, have nothing whatever to do essentially with the inclined system, he omitted any reference thereto; but stated that, with his present experience, if he had had the matter to do over again, there was no doubt as to his adopting the inclined system.

KÖRTING'S IMPACT PURIFIER.

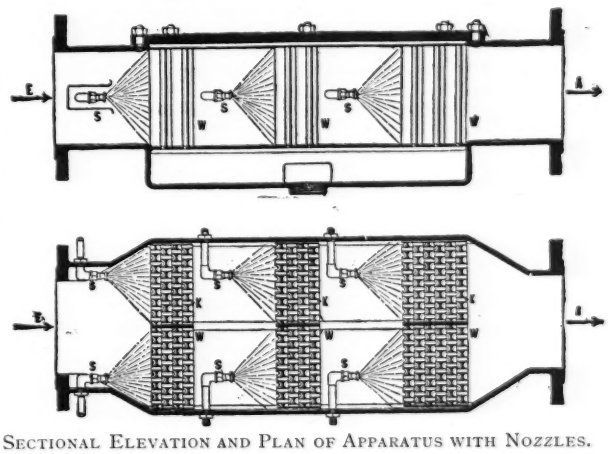
This apparatus is for separating, in a quick and easy manner, dust, water of condensation, and oil, from gases and vapours; thereby effecting, in a simple way, their purification from accom panying solid and fluid admixtures.

The separation of the foreign substances is accomplished by causing the gases and vapour, in passing through the apparatus shown, to come into contact with specially shaped obstacles, with which the apparatus is well provided. These obstacles are either kept moist by the water introduced with the gases to be purified, or by spraying nozzles fixed for the purpose. If the apparatus is intended for separating oil from vapours or from exhaust steam of engines, or to separate the water of condensation

Apparatus Fitted with Separate Water Supply.



A. Outlet. B. Discharge for Water and Impurities. E. Inlet.
S. Nozzles. Z. Water Pipe.



Sectional Elevation and Plan of Apparatus with Nozzles.

from live and exhaust steam, it is constructed without spraying nozzles. On the other hand, if the apparatus is for purifying air and gases from particles of dust, smoke, soot, noxious vapours, and more especially for purifying blast-furnace gases, it is constructed with spraying nozzles. On being forced through the obstacles (which are kept moist), the small particles of dust and other substances remain hanging on the filling material, and pass, with the water, into the collecting vessel underneath.

According to the "Journal für Gasbeleuchtung," the apparatus requires no motive power and no attention; the cost of working is *nil;* it has no moveable parts, and thus little wear and tear.

At the meeting of the Manchester Section of the Institution of Electrical Engineers last Tuesday, Mr. A. R. Bellamy delivered an address on "Large Gas-Engines for Driving Electric Generators." So many grave charges had, he said, been brought against the gas-engine that, if there were no extenuating circumstances, the verdict would undoubtedly be banishment for life. Its merits were, however, becoming better known and acknowledged every day. Gas-engines working with town's gas could produce electric current at a cheaper rate than it was usually supplied at, even for motive power purposes.

WAVERLEY ASSOCIATION OF GAS MANAGERS.

Half-Yearly Meeting at Kelso.

The Eighty-Second Half-Yearly Meeting of the Waverley Association of Gas Managers was held in the Cross-Keys Hotel, Kelso, on Thursday. There was a good attendance. Mr. A. C. YOUNG, of Arbroath (formerly of Kelso), presided; and in opening the proceedings, said he was very pleased that the meeting at Musselburgh last September was a success, although he was not able to be present, He had to thank the members for the letter of sympathy which they sent to him from that meeting.

The PRESIDENT then delivered the following

INAUGURAL ADDRESS.

Gentlemen,—Having had considerable experience in public lighting with incandescent gas-lamps, I wish to make a few remarks upon the working of this system in Kelso. The street illumination of the town is in the hands of the Gas Manager, which is not at all a common state of affairs (the responsibility usually resting upon the shoulders of the burgh surveyor, the police inspector, or the fire brigade staff). But it has very distinct advantages, which demand the consideration of those interested—municipal authorities as well as gas manufacturers. While the adoption of the Kelso system may doubtless tend to increase the burden of care and responsibility resting upon the shoulders of the gas manager—which some of us consider to be heavy enough already—my knowledge of the results in small towns where various conditions prevail, impresses upon me more and more the great advantages that accrue to the gas concern where this method is adopted. It is our duty not to shirk responsibilities, but rather to afford every encouragement to any and all such practices as may promote the interests of the gas industry and increase the efficiency of the services rendered to the public. On the one hand, the Kelso Gas Company have the satisfaction of knowing that while they have control of the lighting, and consequently of the lighting appliances, all necessary repairs are promptly and properly executed, and all leakage and loss is reduced to a minimum; and, on the other hand, the community get the best results that can be obtained from the gas that is consumed and paid for on their behalf.

I am not exaggerating at all when I assert that the streets of Kelso are much better lit than those of any other town in the Waverley district; and that is the opinion I have heard expressed again and again by members of the Town Council and by visitors to this bonnie town. My predecessor, Mr. W. B. M'Lusky, now of Perth, introduced the first incandescent burners into the street lamps some five or six years ago; and the Town Council have gone on increasing the number year by year, until now there are some 70 No. 4 Kern burners, being over 40 per cent. of the whole number of lamps in use.

The effect of the incandescent lighting on a dark evening is very beautiful, and may, perhaps, be best seen as one comes into the town from the railway station. By daylight the view of the town, "bosom'd in woods," as the poet has described it, is naturally the pride of Kelsonians and the joy and rapture of scenery-loving visitors. By night, with the bridge and other prominent features illuminated with Kern burners, the view—veiled, but not obscured—has still a charming effect upon the beholder. After passing over the bridge and coming into the main street and the square, no one can help commenting upon the beautiful effect of the good lighting there, the numerous smaller lights—of 100-candle power each—giving a much better effect, from their more equal diffusion, than could possibly be got from one or two high centre lights at great distances apart.

The Kelso folks and their municipal rulers, who, with some justice, lay claim to the possession of a decidedly artistic taste and sound judgment on things in general, demand to be supplied with the best of everything; and what satisfies them may safely be regarded as good enough for any other community. They claim to have the prettiest town, planted in the loveliest country—the garden of Scotland—the smartest lassies, and the cleanest and best lit streets in the kingdom. Whatever controversy may arise over some of these claims, the last, I think, must remain undisputed.

The public lighting system is based upon a sound and intelligent arrangement as between a public-spirited Gas Company and an efficient Corporation. The first cost of the erection of all new lamps is paid for by the burgh authorities, and all subsequent repairs and maintenance—including the supply and fixing of burners and piping, the labour of fixing mantles, the cleaning and painting, and the lighting and extinguishing of the lamps—are provided by the Gas Company. The gas consumed in the No. 4 Kern burner is computed at 5 cubic feet per hour, inclusive of the bye-pass, and the price actually paid per lamp is 29s. per annum, working out at 3s. 4d. per 1000 cubic feet, as against that of 4s. 2d. to ordinary consumers. This charge fluctuates to the extent of 2s. per lamp, in sympathy with every alteration of 5d. per 1000 cubic feet in price to the general public. The proportion of all-night lamps averages 12 per cent.; and all the lamps are lit during nine months of the year, for twenty-one nights in each month, from dusk to 11 p.m.

The Town Council pay for the mantles at the net price of 6d. each; and the average number used last year was six per lamp. The total cost to the Town Council for gas, cleaning, lighting and extinguishing, repairs, and mantles being 32s. for each No. 4 Kern burner per annum. There is no stinting of mantles. As soon as one of these loses 30 per cent. of the light it should give, off it comes and a new one is fixed. When it is considered that the gas and lighting cost 29s. it is, on the face of it, foolish to lose the full lighting effect for the sake of a shilling or so extra for mantles.

The lanterns in use have only a $\frac{3}{16}$ inch rod passing down the four corners, and shadows are thus reduced to a minimum. The first cost of the lantern adopted is 22s.; that of the burner and cock, with anti-vibrator, 10s. 6d.; and that of the cast-iron pillar and frog about 26s. The burner and lantern can be erected on existing pillars for a sum, inclusive of new piping, of less than £2. To put the burners into the old-fashioned lanterns, such as are still in use at Kelso for the flat-flame jets is not a success. It is imperative that the lantern be attached to a frog at the bottom, to avoid any shaking by the wind at the point where the gas-pipe enters; otherwise great destruction of mantles is the result.

I might go into some facts about high-pressure lighting, having learned something of this system in Arbroath—the home of the inventor; but this would take up more time than is at our disposal. This I may say, however, that for large centres of light, of 1000 candles and upwards, the high-pressure burner is a perfect rival of the electric arc, and should be taken into consideration when the towns we are concerned with come to discuss the *pros* and *cons* of whether it is expedient to spend an annual sum of from £20 to £30 for one solitary electric lamp when a better result may be obtained by the high-pressure gas system for a much smaller outlay.

As we are dealing with the smaller lights at present, you will perhaps pardon me if I close with a summary of the facts as to the cost of incandescent gas as contrasted with electricity—facts that are now accepted by all scientists and lighting engineers of the day. Incandescent gas-light costs 6d. for 2400-candle power; electric light costs 6d. for 250-candle power. In other words, 1000 candles from incandescent gas cost 2½d.; 1000 candles from electricity cost 2s. These figures are based upon gas charged at 4s. 2d. per 1000 cubic feet as in Kelso (which includes all costs, except mantles); while 6d. per unit and 4 watts to 1 candle are taken for the value of electricity. The cost of the mantle, 3s. per annum, and the renewals of the electric glow lamps, are about equal, and need not be taken into consideration.

As it is impossible to over-estimate the importance of incandescent lighting in our public thoroughfares, I trust you will all enter freely into your experiences; and I hope that not only the smaller towns represented here, but some of the larger ones also may get some good points from our discussion.

Discussion.

Mr. P. BLAIR (Haddington) said that in his town the Gas Company had finished with the public lighting when they supplied the gas. The cost worked out at about 11s. per lamp for gas. They computed the consumption at 2½ cubic feet per hour. No doubt they would have a far better light if the Company also superintended the lighting, as they did in Kelso.

Mr. J. GEMMELL (Melrose) thought there could be no doubt that incandescent gas-lamps were the best for public lighting. In his town the Council had control of the lighting. He had had an incandescent gas-lamp at the works, which was the admiration of all who had seen it. The ordinary lamps cost about 11s., whereas this lamp worked out at about 11s. 3d. for gas and 2s. 6d. a year for mantles; but the light was four times what it was with ordinary lamps. Still, the Council did not consider it was sufficient; and they were thinking of going in for an electric installation—their expectation being that with 16-candle incandescent lamps £28 6s. would cover the whole cost of the light.

Mr. A. BELL (Dalkeith) was of opinion that the President was on correct lines with regard to incandescent gas lighting. For street lighting it was to be the light of the future. He noticed that the great point at the Informal Meeting in Glasgow was the lowering of the illuminating power of the gas. The incandescent mantle and burner enabled them to do this, because they produced a heating agent; and he had no doubt that the future would see a very great deal more of incandescent gas lighting—at all events, for the public thoroughfares. His great difficulty was in keeping out the wind, because if it got in it destroyed the mantles. The Bellamy lamp was, he considered, the best; and it had swept the electric light almost entirely out of Liverpool, although the Corporation there generated their own electric current and had to purchase gas from a Company. The lamp was lighted by means of an ordinary pole, and not by a bye-pass. He put up two of them, and during the two months they were up he did not allow them to be cleaned. All the products of combustion were carried out of the lantern; and the moment the light was put out, all the air supply was cut off. These lamps were cleaner at the end of the two months than when they were put up. This showed what could be done. As to electricity, most assuredly it could not compete with gas, in the matter of either light or cost. He thought the Glasgow Exhibition proved that.

Mr. H. O'CONNOR (Edinburgh) said he did not know whether any of those present had seen the more recent Scott-Snell lamp, in which they were proposing to compress the air, instead of the gas. He had recently seen one, and it certainly was far ahead of the old lamp. He thought it would be found much better to compress the air than the gas, because the diaphragm might

leak. If it leaked air, there would be no loss; but if it leaked gas, it would be considerable.

Mr. G. TAYLOR (Jedburgh) said that he had had very little experience with incandescent gas lighting. He thought public lighting was better left in the hands of the Commissioners than otherwise. The Jedburgh Gas Company offered to light the High Street with incandescent lamps; but the Commissioners settled upon the electric light, and their proposal was stopped.

Mr. J. TULLOCH (Loanhead) expressed the opinion that they would be obliged to take up incandescent gas lighting. It had been advocated all round the room that it should be adopted for street lighting; and he did not see why it should not be employed entirely for indoor lighting as well. Perhaps he might offend some of their friends there that day when he said that, if they generally adopted incandescent gas lighting, it would lower the price of cannel coal. He would like to ask the President, when he referred to high pressure, whether he meant the adoption of the Scott-Snell lamps in the streets or the laying of separate mains round the town for high-pressure gas for street-lighting. If the latter, it would also be necessary to put the same services into the houses. He did not see any difficulty in doing this, because he thought that a gas-pipe could be made tight enough to retain gas at high pressure, just as water-pipes were. Therefore, they could get gas introduced at high pressure. It was a matter for their consideration. It was their duty to give it a proper trial, and try to get the candle power of gas reduced.

Mr. L. BELL (Innerleithen) said his town had ordinary street lamps, but they converted them into incandescent lamps. They found that this was ruination for the mantles; and the Commissioners asked him if he could alter the lanterns so as to make the mantles last longer. From October to May, they did with three mantles per lamp—that was during the lighting season. Then the Commissioners took over the matter. They did the lighting themselves, and they found that the lamplighters were not careful in pulling the chains when lighting, and that this, more than anything else, was the cause of the breakages. Last year, the Commissioners erected Welsbach incandescent lanterns, and put the burners into them. It was a far closer lantern; but they found that they required about the same number of mantles as before. It was the lamplighters and the want of anti-vibrators which accounted for them being broken; but he thought if they were properly looked to they could do with fewer mantles a year. The President, in making comparisons between incandescent gas and electric lighting, took the glow lamp. He thought this was scarcely fair; it should be compared with the flat-flame burner. The arc lamp with incandescent gas, and the flat-flame burner with the glow lamp, were far more to the point. In Innerleithen, the mill owners, finding that they had surplus power, thought they would put in dynamos of their own. He put anti-vibrators into several of the mills, and the result was that there were now some 600 or 800 incandescent lamps in mills in the town, and two or three mantles a year served them. A good deal depended upon the anti-vibrator. But the millowners, instead of allowing the workers to turn on the lights, sent round a man to do it. So far, therefore, as the mills were concerned, the Gas Company were as safe as the bank—the millowners were saving money by using gas, and were getting a much better light.

The PRESIDENT said they had a representative of the Kelso local press present; and while they could not expect him to enter into the technical details of street lighting, or to speak as to which was the best sort of burner to use, he was certainly able to judge as to the best method of lighting, and as to whether the arrangements with the Company were satisfactory.

Mr. J. SMITH (of the "Kelso Mail") said he had very much pleasure in bearing testimony as to the efficient way in which the town of Kelso had been lighted since the adoption of incandescent gas-lamps. The Company in every possible way favoured the introduction of improvements in the manufacture as well as in the consumption of gas. Although there had been, at times, just a little suspicion of friction between the Burgh authorities and the Company, these had, by the wise, judicious, and careful treatment of their respective gas managers, been smoothed over; and he believed, so far as he could see as a shareholder, and more recently as a Director, that the result had been entirely satisfactory, both to the Company and to the community. He believed the Burgh authorities were quite satisfied now with the light supplied; and he considered the Company were very generous in supplying as much gas as they could for as small a charge as possible.

The PRESIDENT said he was very pleased to hear Mr. Bell, of Innerleithen, bringing forward the subject of the lighting of the mills. This had been a very difficult matter to deal with. They found all over the country factories going in for electric lighting, which was greatly owing to the difficulty experienced in introducing incandescent lamps. This, again, was due to the cost of the mantles, and their being so easily broken. The mantles were now to be supplied to the trade at 3d. each; and he expected they would be sold to the public at 4d. They knew that although an incandescent mantle remained intact, it lost its power very much—that, indeed, in about a month they might say that 20 per cent. of the light it gave was gone. If they could get a new mantle for 4d., why not take off the old one and put on a new one? He was speaking of street lighting. If a mantle at 4d. lasted a month, it lasted long enough; and if they could get a lantern which cast no shadow, he thought it would be better to fit it up than simply some of those they often saw. The lanterns in Kelso threw practically no shadow, and gave a better light. He thought it was the shaking of the lanterns by the wind, more than the vibration caused by the traffic, which broke the mantles. As to the comparison of gas with the glow lamp, it was not usual to put in an arc light of 100-candle power (he was speaking of the smaller centres); but they could have half-a-dozen incandescent lamps, and get a better light than with a high centre light. The lighting would be better diffused with the smaller lights. He thought it would be unfair to make a comparison with the electric arc lamp, which could not possibly be used in the circumstances. Taking, for instance, the town of Ayr. There were several hundred glow lamps, supposed to give a light of 16 candles each. If incandescent gas-lamps had been used, they would give 100-candle power each. Electricians never considered the glow lamp when comparing with gas. They always put forward the arc light; and, in his opinion, this was fairer. Mr. Tulloch spoke about high-pressure gas and mains. Of course, it was understood that they had not a high-pressure main running through the town. The usual thing was to have a compressor placed in the nearest building to the spot where the lamps were to be erected. High pressure was rather expensive in the first instance. Each compressor cost from £20 to £30, and they had, in addition, the cost of the water. He did not think the system would become general in the smaller towns. In Kelso, for instance, they would require several compressors. He considered that Mr. Taylor was wrong when he expressed the opinion that public lighting should be in the hands of the Commissioners. Undoubtedly, the Corporation did not take an interest in getting the best possible results. If they did, they were not able to work the thing satisfactorily, because they had to go to an outside plumber to get repairs attended to; and they were usually not properly done. Incandescent lamps, for instance, required to be handled by men of some little experience and skill; and they had to be carefully cleaned, as otherwise the lighting was defective. He thought that meters on public lamps were unsatisfactory, because they required four or five meters to every 100 lamps; and in his experience, one of these meters went wrong every quarter. He was pleased to hear Mr. O'Connor's remarks about high-pressure gas. To his mind there was, in what Mr. O'Connor had said, good reason for their encouraging the presence at their meetings of what he might call commercial engineers—men who were actually outside gas management. The gas profession had unquestionably to thank men in business, who manufactured meters and other apparatus in connection with their industry; and he looked to these men in the future. They were more specialists than gas managers, because they had more time to spend upon the work.

CONCLUDING BUSINESS.

Mr. TULLOCH proposed that Mr. L. Bell be elected President for the forthcoming year.

The PRESIDENT seconded the motion, and it was agreed to.

On the motion of Mr. GEMMELL, seconded by Mr. TULLOCH, Mr. William Young (Penicuik) was elected Secretary, in room of Mr. Bell.

Mr. A. BELL, sen., presented Mr. Young with the President's Medal. He said it had just occurred to him that nearly everyone who had been President of the Waverley Association had been called to higher posts, sometimes in their year of office.

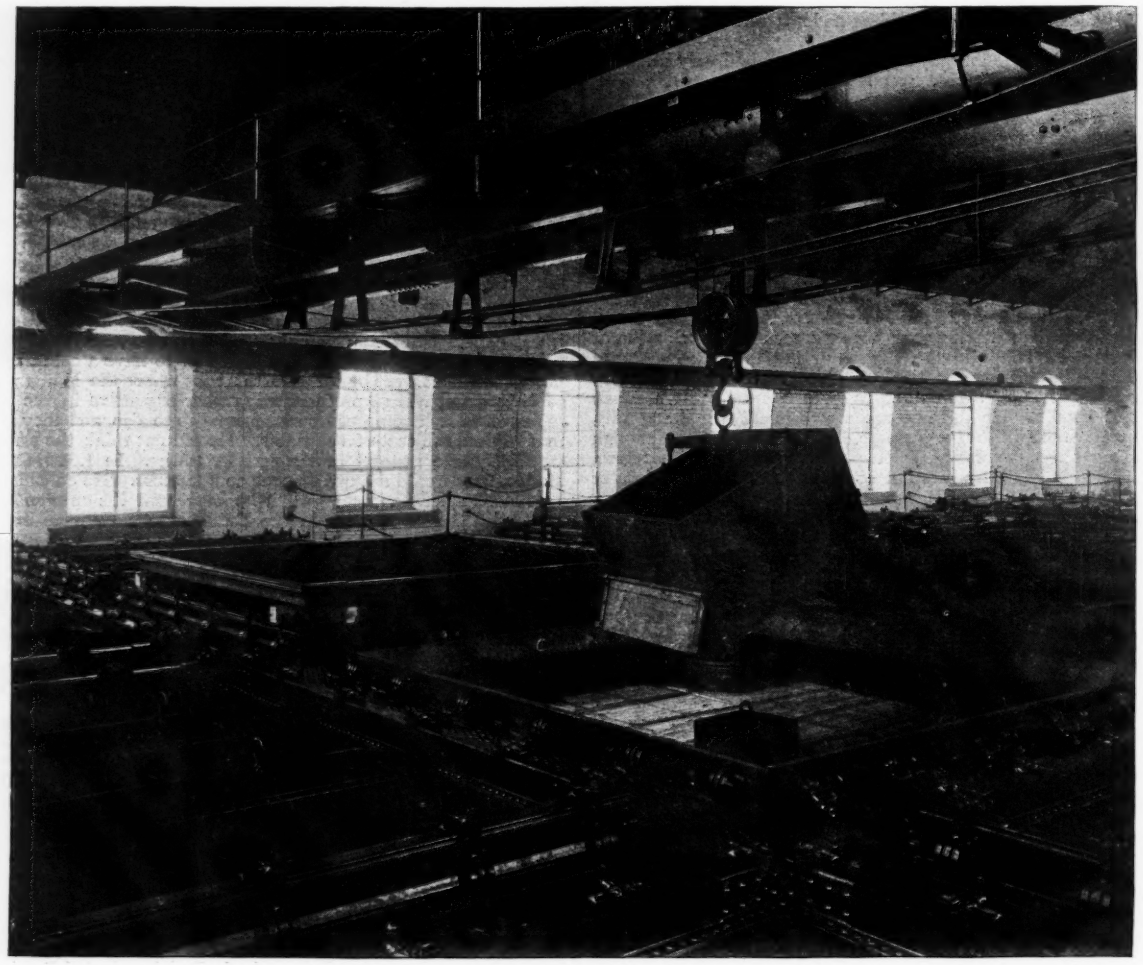
The PRESIDENT returned thanks, and expressed the pleasure he had had in receiving the high honour of being President of the Association.

Mr. H. RUTHERFORD (Aberlady) proposed a vote of thanks to Mr. Young for his conduct in the chair, and of congratulation to him upon his appointment to Arbroath.

The proposition having been cordially received, a vote of thanks was accorded to Mr. Bell for his services as Secretary; and the meeting concluded.

The members and friends to the number of about forty, among whom were several Directors of the Kelso Gas Company, subsequently dined together in the hotel, under the presidency of Mr. L. Bell. After dinner, through the kindness of the Directors of the Company, they were taken for a drive, which was intended to include visits to the mansion houses of Floors Castle, Newton Don, and Hendersyde, with a run through the village of Ednam, where the poet Thomson resided. So much time was, however, spent in admiration of the house and grounds at Floors, the residence of the Duke of Roxburgh, that it was necessary to curtail the excursion; and the party, on reaching Newton Don, resolved to return to Kelso. This step, though in the circumstances it was imperative, was regretted by all, because, in the ideal weather of the afternoon, the outing was most enjoyable.

The late Mr. Charles Sellers left estate of the value of £48,934 gross and £46,953 net. By his will, which has three codicils, he bequeathed £1050 to the York County Hospital, £500 to the York Dispensary, and £1000 to form a trust to be called the "Mary Sellers Christmas Gift Fund" in memory of his mother, the income to be applied annually at Christmas to the relief of 12 poor widows or other needy persons residing in his native village, Fridaythorpe. Among the other bequests are £250 each to the York Certified Industrial School for Boys and Girls, £250 to the Salvation Army, £250 to the Yorkshire School for the Blind, £200 to the Blue Coat Boys' School, and £200 for a stained-glass window in Fridaythorpe Church in memory of his father.



The Purifier House at the Leigh (Lancs.) Gas-Works.

NEW PURIFYING AND OTHER PLANT AT LEIGH, LANCS.

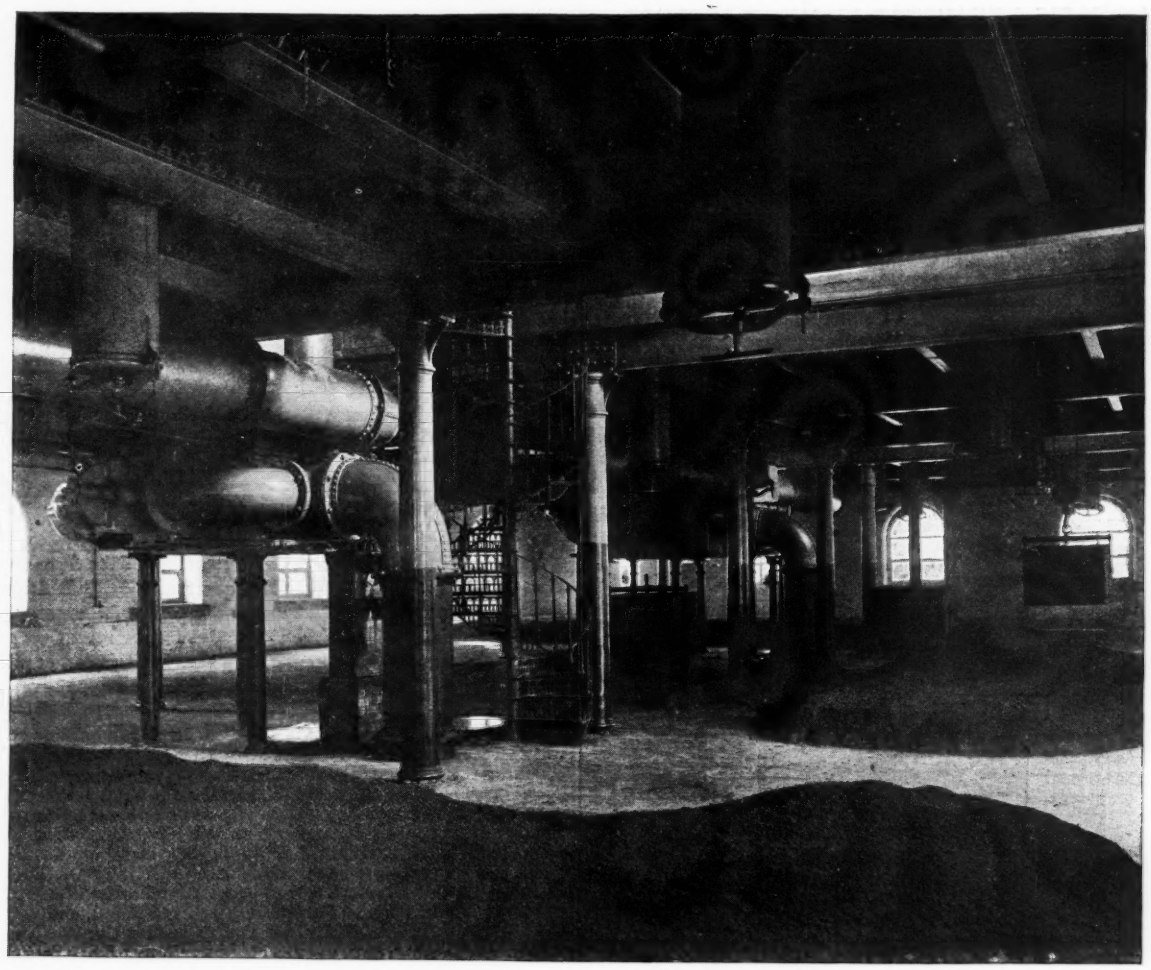
Within a week of a year ago, we gave in the "Journal" what was a somewhat remarkable history of the gas undertaking of the Leigh Corporation, which showed that, although burdened with an abnormal capital account, the concern had surrendered to the ratepayers a good lump sum of profit. We also at the same time gave an account of the works, and of the extensions which the Engineer and Manager (Mr. John Foster) had schemed. Among other things, a new purifying-house, with a governor-house, and chemical laboratory were mentioned. This section of the work has lately been finished, and calls for notice. Its completeness will make it one of the features of the works from the gas engineering point of view, and it is certain to render a good account of itself in the manufacturing operations.

About the new buildings themselves, there is not very much to be said. Neatness, strength, and serviceability are their main characteristics. They are of red brick, relieved by stone facings. The length of the purifying-house is 111 feet; and its span is 61 feet. The height from the floor-line to the eaves of the roof is 35 feet; and the steel roof is boarded and slated. The second building, which constitutes the meter and governor houses and chemical laboratory, is 80 feet long by 26 feet broad, and 18 feet high to the eaves.

The plant in the purifying-house is very interesting. As in many new works, the purifiers are constructed on what is now sufficiently described as Green's system. There are six in all (each 30 feet square by 5 ft. 9 in. deep), arranged in three bays of two. For the accommodation of the centre-valves, and for hoisting the purifying material, the prudently liberal space of 10 feet is left between each bay. In four of the purifiers, there are two tiers of grids for oxide of iron, and in the remaining two three tiers for lime.

A study of the photographs gives a splendid idea of the solid character of the whole of the ironwork put into the structure. The boxes stand on a floor constructed of 18-inch H-steel main girders and 10-inch transverse girders, which are upheld by eighteen 12-inch cast-iron columns, 11 ft. 9 in. in length. The gangways on the top of the purifiers are 3 feet wide in the centre, and 1 ft. 6 in. wide at the sides, made with chequered plates. Each box has four 12 feet square openings, to which have been fitted Clapham's patent "New Century" covers, with "Eclipse" joint and rapid automatic fasteners. To the gangway plates at each opening are bolted four cast-iron curbs, planed on the top and bottom faces, the top face forming the joint for the covers. In this arrangement, the conspicuous feature is the small number of joints on the machined facing. There are, in fact, only four—one at each corner; and, by them, a true face is obtained for the rubber to joint against. To the curbs are attached the automatic steel eccentric fasteners, by means of which each side, or all the four sides, of the cover are fastened down at a single operation. One of the photographs depicts this unique arrangement of fastening down the covers. We say "unique" because this is really the first installation of purifying plant in which the "Eclipse" joint and automatic fasteners have been applied; and the fact that there has not been the slightest hitch with this introduction of a fresh convenience in the work of the purifying-house speaks eloquently for the manner in which the contractors and patentees (Messrs. Clapham Bros., of Keighley) studied every detail and ensured against any impediment to free working. The height at which the bottoms of the purifiers are fixed from the ground floor affords plenty of clearance and headway, after making due allowance for the 24-inch steel connections which are attached to the H-girders of which the floor is composed. An eight-way Weck centre valve and a four-way one are erected on suitable piers and coupled with the mains.

As to the discharging and charging of the purifiers with material, the boxes are emptied by means of the shoots shown in the photographs; and their re-filling is accomplished by an overhead electric travelling crane, which is also used for the removal of the covers. This, so far as we know, is the only instance of electrical power being used in the actual operations (other, of course, than lighting) of a purifying-house. Mr. Foster has paid special attention to the elevating of the oxide from the floor below the purifiers; and the method he has adopted is stamped by ingenuity and simplicity. The oxide is revivified, as will be seen, on the ground floor; and there a number of trolleys are used in the feeding of movable hoppers, each of which has a capacity of 25 cwt. The hopper is raised from the ground floor by means of the crane and lifting slings; and passed over the openings of the purifiers. When in the desired position, a catch on one side of the hopper is withdrawn; and the contents of it are immediately liberated. Quick manipulation and



The Revivifying Floor at the Leigh (Lancs.) Gas-Works.

satisfactory distribution of the quantity of material required for boxes of the dimensions of these new ones are secured by this simple method.

Among the other work which was covered by the contract of Messrs. Clapham Bros. was the supply and erection of one of their patent "Eclipse" water-tube condensers, the removing and refixing of the station meter and governors (with valves and connections to the valve-house), and the coupling up, by means of 24-inch and 18-inch connections, of the new purifying-house to other parts of the works. The chemical laboratory has also been equipped in the most modern and approved manner.

It is safe to predict a long and useful life for the whole of the new plant described here, which was designed by Mr. Foster, and carried to successful completion, under his direction, by Messrs. Clapham Bros., whose work is not frequently brought prominently before our readers. As an example, that at Leigh will not give room for adverse criticism.

CAPRICIOUSNESS OF INCANDESCENT LIGHTS.

The following is an abstract translation of an article on the above subject by Herr G. Rothgiesser in a recent number of "Der Gastechniker."

It is well known that it is difficult to give the exact candle power of incandescent burners or mantles. When repeated measurements are made with the same burner or mantle, great differences are often observed, only a few of the causes of which are known. The illuminating power of a mantle depends very much on the material of which it is made, but also on the heat of the flame, which is highest when the gas and air are mixed in the right proportions. Such proper admixture can be effected either by making the distance between the nipple and the flame as great as possible, or by inserting gauze or other obstructive material in the course of the uprising jet. Both of these ways have their limits. In many cases it is not possible to increase the height of the burner considerably, while the employment of gauze, &c., is limited by the force of the gas-jet, which depends on the pressure of gas and the size of the holes in the nipple. Therefore, gauze, &c., may be inserted to effect a thorough admixture, if the pressure is high; but if it is low, the resistance offered by the gauze prevents the jet drawing in the necessary quantity of air for proper working of the burner, and so causes the proportions of the mixture to be wrong.

It is well known that gas pressure varies widely in different towns, and even within one and the same town. The consumption of gas may be regulated by making the holes in the nipple larger or smaller. But the use of the same burner for widely different pressures cannot be recommended, since the burner which gives good results at a high pressure will not do so at a low one, and *vice versâ*. This circumstance has not been generally taken into account, and burners are usually manufactured for a medium pressure. It would, however, be better if an adjustable burner were constructed, so that it could be adapted at one time for a very low pressure, and at another for a very high one. Whether such a burner could be made, is still an open question.

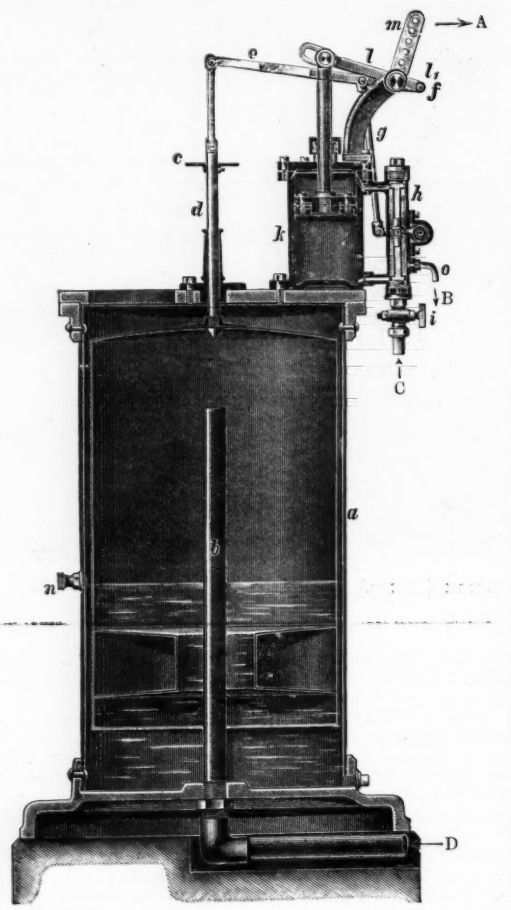
Though with ordinary incandescent burners consuming about 4·24 cubic feet of gas per hour, such an adjustable burner has seemed unnecessary, this will not be the case with the high-power burners, consuming about 7·06 cubic feet per hour, which have lately come into use. The burner has already been enlarged in order to bring about good admixture; but the holes in the nipple and the resistance offered by the gauze, &c., ought to be made adjustable, in order to ensure that the right proportions of gas and air are always secured.

The fact that the admixture can be improved by vibrations of the molecules may be taken advantage of in the case of high-power burners. Electrical vibrations exercise a favourable influence upon the mixing of gas and air in the burner. The same is the case with sound vibrations, which cause a considerable increase in the light of an incandescent burner, in which the gas supply is in excess. It may consequently be advantageous to construct burners with some arrangement for producing artificial vibrations. In the same manner that electrical vibrations affect the thoroughness with which the gas and air mix, the light waves also may act. Perhaps such action may afford an explanation of that capriciousness in illuminating power of the incandescent gas-light which has hitherto not been accounted for. The reflected light and the temperature of the room in which the photometric tests are made must be taken into consideration in future. Great differences in the illuminating duty are likely to be obtained, according to whether there are or are not sound vibrations permeating the room.

PINTSCH'S EXHAUSTER-ENGINE GOVERNOR.

Herr Rauser, of Berlin, described, at a meeting of Bavarian Gas and Water Engineers, a type of governor for the steam-engine of a gas-exhausting plant, constructed by Messrs. Pintsch; and we take the following account of his description from the "Journal für Gasbeleuchtung," in which it has recently been published.

Governors for regulating the number of revolutions of the steam-engine of an exhausting plant, according to the variations in the quantity of gas with which the exhauster has to deal, have long been in use, and usually comprise a floating bell, which is acted upon by the pressure anterior to the exhauster, and, by means of gearing, opens or closes a throttle-valve. The Pintsch type of governor or regulator differs from these in every respect, except that the pressure-actuated bell is retained. The governor is shown in the accompanying illustration. The pipe *b*, having



A. To Regulating Valve of Steam-Engine. B. Water Outlet. C. Water Inlet. D. From the Main to the Suction Side of the Exhauster.

its mouth within the tank *a*, is connected with the gas-main on the suction side of the exhauster. A bell with float, weighted so that it takes up its intermediate position at the desired pressure, is placed in the tank, which is filled with water to the level of the overflow screw *n*. To the bell is attached the rod *d*, which is provided with a weight-carrier *c*, and is connected to the moveable arm *e*. This arm is connected with the double-armed lever ll_1 by means of the bolt *f*. The rod *g* passes from the lever *e* to a sliding-valve, perforated lengthwise, in the casing *h*. This valve controls the inflow and outflow of the water, and cuts off the high-pressure water which enters the cylinder *k*. The piston which runs in the cylinder is connected with one arm of the double lever ll_1. This lever is rigidly attached to its shaft, on which is also the lever *m*, which controls the regulating-valve of the steam-engine. The cock *i* is connected, in any convenient way, with the water-service.

If the desired pressure prevails in the main anterior to the exhauster, then the bell (and therefore also the slide in the casing *h*), the piston of the cylinder *k*, and the regulating valve of the steam-engine, all stand in their mid-way positions. If, however, the exhauster runs too slowly, and the pressure in the main on the suction side of the exhauster begins to rise, the bell is driven upwards and the lever *e* is turned about the bolt *f*. Consequently, the rod *g* is raised, and the slide within the casing *h* is thus displaced, so that water under pressure enters the cylinder *k* from a water service or reservoir, and drives the piston upwards, while the water above the piston runs off at *o*. The movement of the piston turns the lever ll_1 and the lever *m*, and thus puts the regulating valve in such a position that a greater amount of steam can enter the engine. The rod *g*, however, is, in consequence of the turning of the lever ll_1 brought back to its first position, and the slide to its closed position. The inlet and outlet to the cylinder are thus shut off, and consequently the piston cannot move, and the regulating valve is thus fixed in its new position. When fresh fluctuations of pressure cause a movement of the bell, displacement of the slide, piston, and regulating valve again takes place. A drop in the gas pressure is followed by a descent of the bell, whereupon the operation of the regulator is reversed. The water used is quite trifling in quantity, as only when the pressure fluctuates are the small amounts which correspond to the movement of the piston consumed. A water pressure of 13 to 16 feet head suffices for working the regulator.

When this regulator is used, the steam-engine needs no governor; but if one is in use, it must be so disposed that it only fixes the maximum speed of the engine. The first of these regulators was put in at the Imperial Continental Gas Associations' works at Neu-Weissensee, Berlin, about a year-and-a-half ago, and it has answered well. There are now a great number of them in use at other works.

MODERN HIGH-POWER GAS-BURNERS.

A paper presented last year to the meeting of the Association of Gas, Electricity, and Water Engineers of the Rhine District and Westphalia by Herr Graumann, Manager of the gas-works at Oberhausen, deals with the rapid advances in recent years in the illuminating duty obtainable from gas. The paper, of which the following is an abstract translation, was lately published in the "Journal für Gasbeleuchtung."

The early batswing, fishtail, and argand gas-burners were satisfactory under the law of "large burners, feeble pressure," which was at one time the guiding principle in the use of gas for lighting. The demand, however, for more powerful sources of light for large rooms brought in the sun-burner, which was an aggregation of open-flame burners. The question next arose whether the growing demand for more light could not be met in some other way than by the mere multiplication of the number of burners. The factors which determined the illuminating power of a flame were studied. On the one hand, endeavours were made, by carburetting the gas, to render the flame more highly illuminating, and, on the other hand, to effect the supply of air to the flame according to established laws. Thus the air supply was first warmed by the heat liberated by the flame; and the regenerative burners were the upshot. A Siemens burner on this principle was brought out in 1879; but the later inverted type, which was referred to under the title of "A Revolution in Gas Illumination,"* appeared in 1887. There were many similar types of regenerative lamps. Meantime, however, other inventors had been busy developing the incandescent system of lighting. In 1885, Fahnehjelm perfected his magnesia comb, which gave a light of 12 to 14 candles with a consumption of 5·3 cubic feet per hour. Then Welsbach, in 1886, made known his great discovery; but his expectations of it were not at once realized, and even in 1889 the regenerative type of burners gave the highest duty. In the following year, however, the incandescent burner advanced to the foremost place; and it has since retained its position.

Subsequent improvements of the incandescent burner were made on different lines. The mantle was made open at the top, in order to increase the diffusion of air into the flame, and air was admitted laterally through holes in the chimney. Combustion in the zone of the mantle was increased by the application of either the air or gas under pressure. Other inventors, such as Denayrouze, aimed at a more intimate admixture of air and gas in the burner as a means of increasing the illuminating power. He also attempted preheating the air supply before it reached the burner.

The author has examined a number of the more recent forms of incandescent gas-burners, and the results of his examinations are given in the subjoined table, which shows, for comparative purposes, the efficiencies of the chief burners, old and new, known in Germany:—

Burner.	Consumption.	Illuminating Power.	Consumption per 1000 candle-hours.
	Cubic Feet per Hour.	Candles.	Cubic Feet.
7 cubic feet batswing	6·50	10·3	631
Berlin standard argand ("Elster")	5·30	12·8	415
Siemens' inverted regenerative lamp	42·40	252·5	169
Welsbach (1888)	3·35	14·9	226
Welsbach (1901), with Killing's mantle (new)	4·30	82·5	52½
"Kugel" or ball high-pressure light	31·80	880	34—40½
Lucas high-pressure light, about	19·40	440	44
Recent high-power burners, upwards of	—	212	27—57

* See "JOURNAL," Vol. L., p. 1045.

REGISTER OF PATENTS.

Retort-Charging Apparatus.—Foulis, W., of Glasgow. No. 7845; April 16, 1901.

The object of this invention is "to provide means whereby the charge is introduced at one operation, or, at most, by two operations."

In order to effect this, the charge of coal is put into a scoop (formed in cross-section like a flattened tube having a wide opening at its upper side), mounted on a carriage provided with wheels or rollers, running in a frame preferably made of channel bars, and arranged so that it will move freely backwards and forwards. Fitting easily in the scoop is a pusher attached to a rod, and provided with means for working it backwards and forwards in the scoop. When the scoop has been filled with coal, it, and its charge, are run into the retort with considerable velocity, and, when at some distance from the back of the retort, the scoop is stopped, which may be done by bringing it up against a stop. By the momentum acquired, coal from the scoop, shoots forward to the end of the retort, and the pusher, being brought up against the coal, holds it in position while the scoop is being withdrawn. The pusher is then withdrawn, leaving the coal in the retort. When the charge is introduced by two operations, the first portion of the coal is introduced as described; but, in introducing the second charge, the scoop is stopped some distance from the coal introduced by the first operation, so that the coal moves forward against that already in the retort, and the pusher is then moved so as to keep the coal in position while the scoop is being withdrawn.

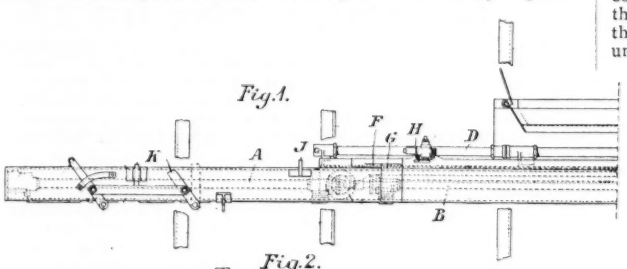
In order that my invention may be clearly understood, I will describe, with reference to the accompanying drawings, an arrangement in accordance therewith for charging the retorts by two operations.

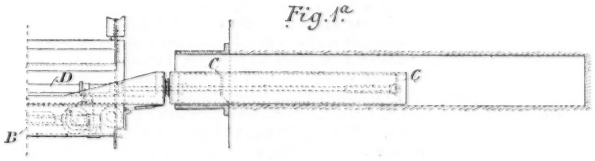
Figs. 1 and 2 and 1*a* and 2*a* are a side elevation and plan of the apparatus; fig. 3 is an end view showing the charging device.

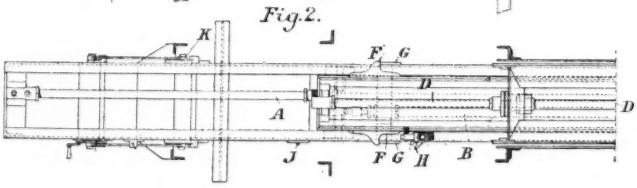
The frame on which the charge-inserting mechanism travels is adjustably mounted on a carriage having wheels travelling on rails in front of the retorts; and the scoop is attached to a carriage provided with wheels running on the frame. The coal may be charged into the scoop by a drum or by a measuring chamber connected with a coal-hopper, to direct the charge of coal into the scoop before the scoop begins to move. Or the scoop may be charged by a drum or measuring chamber, shorter than the scoop, turning at such a speed as to charge the scoop while it is being moved forward. In this case, it is preferable to move the scoop slowly until it has received its charge of coal, and then to increase its speed sufficiently to give the coal the requisite momentum. The speed of the drum or measuring chamber is controlled by the movement of the scoop by chains, or a rack and pinion, or, when hydraulic power is employed, by the valve of the hydraulic motor. The carriage, scoop, frame, coal-hopper, drum (or measuring chamber), and other parts are arranged to move along in front of the retorts, and so that the frame carrying the scoop and other parts can be raised and lowered. The drum or measuring chamber, for filling the scoop, is provided with moveable stops to control the amount of turning, so as to vary the amount of coal charged into the retort, or—when air or hydraulic motors are employed—the amount of turning may be controlled by an admission-valve operated by a cam or screw; the movement of the motor reversing the screw and shutting the valve.

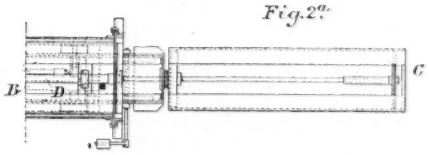
A is the hydraulic ram by which the scoop is inserted in the retort, and B is a similar ram by which it is withdrawn. The piston or plunger of the ram frame is connected at its outer end to the front axle of the carriage; while the other piston is connected, at its outer end, to the rear axle. A pusher C (adapted to slide in the scoop) is attached to the outer end of a piston or plunger of a hydraulic ram D; the motive fluid being admitted alternately to opposite sides of the piston, so as to effect the forward and rearward movements of the pusher.

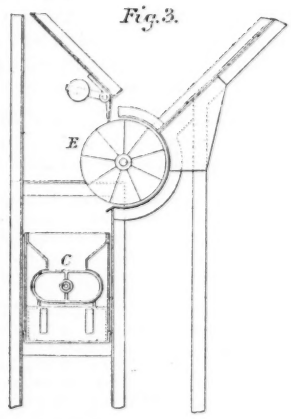
When the carriage and scoop are in the rearmost position, the scoop is in the situation to receive coal from the coal-drum E, and, while in this position, sufficient coal is fed in to supply the retort with one-half its full charge. The scoop having been charged, the motor stops, and fluid under pressure is admitted to the hydraulic ram A, behind the piston, whereupon it rapidly drives the carriage forward and inserts the scoop into the retort, until projections F on the sides of the carriage come into contact with fixed stops G on the frame. Before the carriage reaches this position, a lever on the stem of the valve, by coming into contact with a pin or projection on the frame, operates the valve so as to admit fluid under pressure to the rear side of the piston of the ram, thereby causing the pusher to move forward on the scoop. By the sudden stoppage of the carriage by the projections coming into contact with the stops, the coal contained in the scoop is projected into the forward part of the retort by the momentum acquired, assisted by the continuing forward motion of the pusher. Fluid is then admitted under pressure to the ram B, and the exhaust passage to the ram is











opened so as to effect the withdrawal of the scoop from the retort. When the lever H comes into contact with the pin or projection J, it reverses the valve and opens the exhaust passage to the rear side of it; so that the pusher will then move rearwardly in the scoop, which will then be in position beneath the coal-drum to receive another supply of coal to be inserted into the retort to complete the charge. The scoop, having received the second supply of coal, the carriage and scoop, together with the pusher, are again moved forward; but as the scoop is not required to be inserted so far into the retort as when introducing the first supply of coal, movable stops K are brought into position to suddenly stop the forward movement of the carriage when the forward end of the scoop has entered only a short distance into the retort.

An arrangement is made whereby the scoop can be charged while it is making its rearward movement after its charging stroke. For this purpose, the coal-hopper is provided, at its discharge (or lower) end, with doors or slides, each pivoted to one end of a link, the other ends of which are keyed to shafts or spindles, mounted in bearings on the hopper, and carrying weighted levers, which tend to turn the shafts or spindles in the direction to close the doors or slides. Secured to the rear side of the pusher which slides in the scoop, is a wedge-shaped projection, which, as the scoop is moving from the retort, passes between projections on the adjacent edges of the doors or slides, and forces the doors or slides apart against the counteracting pressure of the weighted levers, and so the lower part of the hopper is opened and coal falls from the hopper into the scoop. By this arrangement, a measured quantity of coal can be fed into the hopper while the scoop is inserting a charge into the retort; and afterwards the coal is discharged into the scoop while it is making its return movement. In this way, considerable time is saved in working the apparatus.

Mixing Air and Gas and Governing Devices for Gas-Engines.—Flint, W. P., of Pittsburg, Penn., U.S.A. No. 7055; April 3, 1901. Date claimed under International Convention, Sept. 6, 1900.

This invention (relating to air and gas mixing and governing devices for gas-engines) has for its object to provide a valve whereby the amount of the explosive mixture supplied to the engine may be varied, by means of the governor, without the relative proportions of air and gas in the mixture being varied—a manually operated device being provided for varying the proportions of air and gas in the mixture in accordance with the richness of the gas and other conditions.

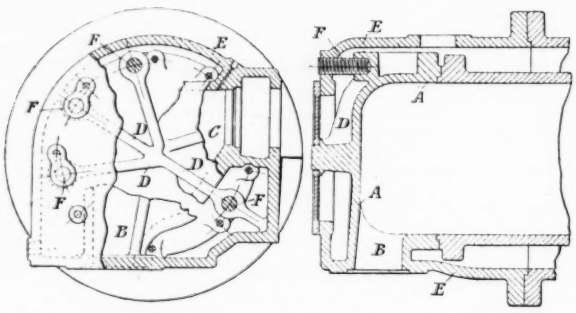
Apparatus for attaining this object has already been devised by Westinghouse and Ruud, comprising a stationary bushing provided with separate ports for the admission of air and gas, another set of ports for the outlet of the explosive mixture, and a tubular valve located within the bushing made in two parts—one having ports corresponding generally in number and position to the air admission ports in the bushing, and the other having ports corresponding generally to the gas admission ports and the ports for the outlet of the mixture in the bushing. In such an arrangement, rotary movements of the parts obviously independently control the proportion of air and gas in the mixture; while a longitudinal movement in the bushing under the action of the governor controls the amount of the mixture supplied to the engine. It is, however, found in this construction that the partial vacuum formed inside the mixing-valve tends to draw the two halves together; and if the joint between them is not absolutely true, they will not be co-axial, and consequently will bind or seize in the bushing—thus disturbing the regulation of the engine.

According to the present invention, the valve is in one piece, by which means the making of a troublesome joint is avoided, and at the same time the valve is rendered less liable to derangement. Moreover, the necessity for providing two sets of devices for notably adjusting the valve is overcome, and the construction is simplified and strengthened.

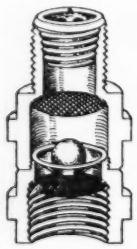
Cylinders of Internal Combustion Motors.—Crossley, W. J., of Manchester, and Atkinson, J., of Marple. No. 5189; March 12, 1901.

This improvement in the construction of the cylinders of internal combustion motors (especially those of large size) is a further modification of that described in patent No. 27,041 of 1898.

In the cylinders of large internal combustion motors, it is necessary, the patentees remark, to water-jacket the combustion chamber; and, to enable this water-jacket to have full cooling effect, the metal forming the walls of it should be kept as thin as possible. As it is desirable that the combustion chamber, with its inner and outer walls, should form one casting, great care has to be taken in its design, so that it shall be, as far as possible, free from internal strains—either casting strains or working strains. If the inner walls are properly supported by the outer walls, they may be made thinner than if not thus supported.



In the arrangement described in the 1898 patent, the inner walls of the combustion chamber were connected to the outer walls of the cylinder by the exhaust-passage, the inlet passage, and a number of ribs. In the improved form (shown), the exhaust passage and the inlet passage tie the inner walls A to the outer walls E at two points; but they are otherwise left unconnected from each other in the casting, which is thus practically free from any internal strains due to cooling. Subsequently, the outer walls are tied to the inner walls by bolts or studs F, screwed into bosses in the outer walls E and the inner walls A; also suitable ribs D are arranged on the combustion chamber walls to distribute the strains. The casting is thus free from any but working strains due to pressure and varying temperatures.

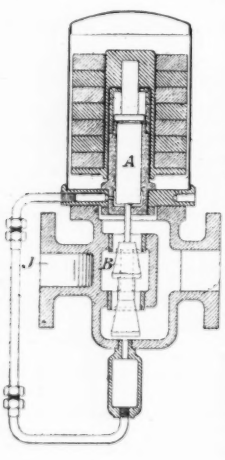


Regulating the Pressure in Gas-Burners.—Offenberg, M., of Berlin. No. 17,927; Sept. 7, 1901.

This apparatus (as shown) consists of a casing containing two pieces of wire-webbing, the lower of which supports a funnel-shaped cup in which is a hole closed by a ball made of steel; while the cup is of aluminium, in order to avoid oxidation. The regulation of the gas pressure is effected by the gas lifting either the metal ball alone, or the whole cup together with the ball. The wire-webbing in the upper part serves "for uniformly propagating the gas in the upper part of the nipple."

Valves for Reducing Pressure.—Ross, G., and Shoubridge, S. Y, of Lower Sydenham. No. 79; Jan. 1, 1902.

The improvements consist in the combination (as shown) of an equilibrium valve with a hydraulic ram, so arranged that the fluid beneath the ram is acted upon by the pressure on the outlet side of the valve. The pressure on the outlet side of the valve is regulated by weights placed upon a frame resting on the top of the hydraulic ram. The body of the valve-casing is made in such a way that the steam, water, or other fluid is admitted to the valve-chamber on opposite sides of the valve, and so the valve is maintained in equilibrium, and the steam, water, or other fluid leaves the chamber through openings in the top and bottom. A small vessel is attached to the body of the valve-casing beneath the valve, or in any convenient position on the outlet side of the valve, to act as a condenser. This condenser is connected with a pipe to the hydraulic ram casing.



The steam or other fluid entering the valve-casing at J, passes through two ports into the valve-chamber, and thence through the openings in the top and bottom of the valve-chamber to the outlet. The pressure on the outlet is conveyed to the bottom of the ram A (which carries weights), and to which is suspended the equilibrium valve B. When all the weights are on, the valve is wide open, and the pressure on the outlet is equal to that on the inlet; but on taking weights off, the pressure on the ram partly closes the valve and reduces the pressure on the outlet side. The pressure so reduced remains constant provided no more weights be removed or put on, notwithstanding that the pressure on the inlet be varied, or the quantity of fluid passing through the valve be varied by opening or closing the outlet.

APPLICATIONS FOR LETTERS PATENT.

7618.—Law, J. & J., "Production of acetylene gas." April 1.
7634.—Soutter, E., and Soutter, W., and Sons, Ltd., "Globes or shades of gas and other lamps." April 1.
7741.—Engelking, W., "Operating pumps, blowing engines, or compressors for air or gas, without using a fly-wheel." April 2.
7750.—Aron, H., "Coin-freed gas-meters." April 2.
7826.—Lowe, T. S. C., "Manufacture of coke." April 3.
7845.—Husson's Safety Acetylene Syndicate, Ltd., and Weston, W. H., "Acetylene generators." April 3.
7856.—Baylis, R. N., "Gas-controlling devices for gas-engines, pumps, and the like." April 3.
7865.—Barnett, B., "Smoke catching devices for gas-brackets." April 3.
7883.—Storey, A. W., "Gas, oil, and similar engines." April 4.
7939.—Langdon-Davies, W., and Soames, A., "Internal combustion engines." April 4.
7956.—Hills, H. G., "Manufacture of gas." April 5.
7971.—Gibbins, W. G., "Lighting incandescent burners." April 5.
8003.—Boult, A. J., "Gas, water, or like measuring and registering apparatus." A communication from La Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz. April 5.
8004.—Boult, A. J., "Gas-reservoirs." A communication from La Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz. April 5.
8008.—Wood, E. A., "Incandescent gas lighting." April 5.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by correspondents.*]

Flame-Luminosity and "Cheap Gas."

Sir,—Although it be a "red herring" across the line of my purpose, I will satisfy your curiosity as to where I found the word "dilute." It is in my dictionary, where I also find the definition: "To reduce the strength or standard of." It was no great leap, therefore, nor was it in the dark, when I "jumped to the conclusion" that town gas reduced to a standard of "eight or nine candles or even less," is a diluted gas.

You naturally summon phrases, rather than facts, to your pen, after I have shown that the only available means of effecting the dilution of coal gas to such a standard involve consequences disastrous to the gas industry; and, for my part, I will rest on your declaration that "the dilution of coal gas is rightly classified as a heresy." For, notwithstanding your complimentary allusion to my imaginative qualities, I am unable to discover any counter-argument in your current editorial.

38, *Victoria Street, S.W., April* 11, 1902. A. G. Glasgow.

[Does not the expression "diluted," applied to a substance, imply the addition of another substance called the "diluent?" There being no suggestion of a diluent in the case in point, we venture still to question the appropriateness of the word in this connection. Opinions may differ as to what it is that Mr. Glasgow has really "shown" in this brief controversy. Like himself, we have no fancy for disputing about words when it is facts which are in question, and therefore agree that the arguments are for the present at an end.—Ed. J.G.L.]

The Simmance-Abady Calorimeter.

Sir,—The kind notice which you have given to my little pamphlet on "Calorimetry" (*ante*, p. 887) encourages me to hope for further indulgence at your hands.

You call special attention to the fact that flame-length, temperature, effectiveness of mixtures, &c., do not vary directly with calorific power; and on this account you question whether calorific tests can be considered a more perfect and universal guide to the practical value of gas, than (say) photometry—in other words, whether calorimetry "bottoms the problem" of gas-testing.

Now I have never claimed that the calorimeter takes the place of all other apparatus for testing gas, or that it places on equal terms all apparatus for using gas. But, as the point is thus challenged, I now express the opinion that a knowledge of the calorific power of gas—as ascertained in the calorimeter, and in the manner described in the pamphlet under review—does "bottom the problem" of gas-testing, because this is the only practical method by which the "energy-value" of gas can be expressed in terms of its sources of origin—namely, coal enrichment material. The gas-making industry consists of forming a fuel-centre in a district, and distributing over that district. That is to say, energy is stored at one point, for use at many points. Obviously, the economy of the process must be adjudged by the loss in manufacture. Calorimetry enables this loss to be measured; and by its means the total heat-units of gas distributed can be compared (and in the same terms) with the initial energy of the coal and the enrichment materials used.

The actual profits may be affected by competition, local circumstances, &c. But the nearer the units of heat-energy distributed approximate to the original power of the coal used, so more nearly does the gas-making approach perfection; and I should imagine that every gas-maker would willingly sacrifice all his bye-products if he could only bring to his station-meter the full heat-energy value of his original coal.

The other point which is referred to is the use of the term "foot-calories." If I err, it is in using the expression "foot-calories" instead

of "calories per cubic foot," which, though it is often converted by means of multiplication, into B.T.U's., is the measure in which, in practically all cases, calorific tests are made. I, therefore, sin in good company, and still think that "foot-calories" is a more convenient term than "calories per cubic foot;" and it means the same thing.

The obvious method of avoiding a mixture of the metric and British systems of measurement (for which I am not responsible) has escaped your reviewer. It is to measure the gas according to the metric system, and then we should have consistency.

By the bye, "British thermal units per cubic foot," is also a hybridization. To be consistent, one should say, "British thermal units per pound of gas;" and I do not think even the most hardened technician would welcome this change.

One more word. The instructions in the handbook apply equally to all calorimeters in which the precautions necessary to accuracy are to be found, and do not refer solely (as is erroneously assumed) to the Simmance-Abady calorimeter.

Westminster, S.W., April 11, 1902. JOHN F. SIMMANCE.

Mr. Fletcher on Photometric Appliances and Photometry.

SIR,—Referring to the letter, on the above subject, in the "JOURNAL" for the 1st inst., I have the greatest respect and admiration for Mr. Fletcher's *obiter dicta* on his own special subject—that, namely, of heating by gas; but when he writes about something with which he is not fully conversant, he falls, as others do,* into grievous error. His acquaintance with photometrical work, and its appliances, is doubtless very limited; yet because of his own unfortunate experience with a meter and a clock, he is rash enough to assume that the correctness of such appliances is never checked, and thereupon to cast aspersions on the accuracy of the work done with them.

I am not concerned to take up the cudgels for the makers of photometrical apparatus. They are well able to take care of themselves. But I may tell Mr. Fletcher, not only that the appliances he refers to are regularly tested by an experienced photometrist, but also, as I will prove, they are in general so correct that quite remarkably accurate work is possible with them.

The tests Mr. Fletcher has applied are not, however, necessary for photometrical work. The clock is required to be correct each minute, in order that the hourly rate of gas consumption may be tested by one minute's observation. It also serves to time the consumption of 40 grains of sperm. With five first-class photometers under my care, I seldom find a clock incorrect to the extent of more than one second in ten minutes, or an error of one-sixth of one per cent. A photometrical test lasts for ten minutes; and a slight variation between the up and down rate of the clock would not appreciably affect the result. In the extreme instance to which Mr. Fletcher refers, seven per cent. on the half minute amounts to two seconds, which could only make an error of one-third of one per cent. on the whole ten minutes' test.

That very accurate results may be obtained with the ordinary apparatus, is shown by the following figures. I have taken the last ten tests made by the Official Gas Examiner for the city of Sheffield, together with the corresponding tests by myself on the same gas, and, of course, using the same apparatus.

My Test. Candles.		Official Test. Candles.		Difference. Per Cent.
17·08	..	16·89	..	1.0
17·54	..	17·47	..	0·4
17·63	..	17·58	..	0·3
17·77	..	17·67	..	0·6
17·16	..	17·03	..	0·8
17·62	..	17·66	..	0·2
17·48	..	17·44	..	0 2
17·34	..	17·43	..	0 5
17·70	..	17·61	..	0·5
17·14	..	17·14	..	Nil

That such closely agreeing results can be obtained by two operators, acting quite independently, is, I contend, strong testimony not only to the perfection of the apparatus, but also to the value of the method of testing.

Sheffield, April 11, 1902. JOHN T. SHEARD.

The Late Mr. Richardson.

SIR,—In your "Obituary" paragraph as to the late Mr. W. A. Richardson, of Birkenhead, I notice you have omitted any reference to the fact that he was President of the British Association of Water-Works Engineers for the current year.

May I take this opportunity of publicly expressing the keen regret felt by every member of the Council of that body at the loss of his genial presence and most effective guidance and support—a feeling shared, I am sure, by every member of the Association who was personally acquainted with the late President.

PERCY GRIFFITH, Secretary.
British Association of Water-Works Engineers.

51, *Parliament Street, S.W., April* 9, 1902.

Sales of Shares and Stock.—At the Mart, Tokenhouse Yard, on Monday last week, Mr. Alfred Richards conducted a sale of new issues by orders of Directors. The first lots submitted were £10 preference shares (5 per cent.) in the South-West Suburban Water Company; and they were sold at prices ranging from £11 to £11 7s. 6d. per share. The Plymouth and Stonehouse Gas Company offered £2750 of 3½ per cent. perpetual debenture stock, which was placed at £87 10s. and £90 per £100 of stock. Some ordinary "F" £10 shares in the Aldershot Gas and Water Company fetched £14 each. On the same occasion, some 5 per cent. preference stock of the Brentford Gas Company was sold for £130 10s. per £100 of stock. On Thursday, Messrs. Garrod, Turner, and Son sold, in accordance with the announcement which had appeared in our columns, £3000 of new "C" stock of the Ipswich Gas Company, at £21 10s. and £21 12s. 6d. per £10 of stock—the latter being the price realized at the previous sale of this class of stock.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Lords Bills read a second time and committed: Caterham and District Gas Bill, Darley Dale Water Bill, Deal and Walmer Gas Bill, Wrexham Water Bill.

The Tipton Urban District Council Bill has been withdrawn.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Thursday, April 10.

(*Before the* LORD CHIEF JUSTICE *and Justices* DARLING *and* CHANNELL.)

Gaslight and Coke Company v. Cannon Brewery Company.

This was an appeal by the plaintiffs from the decision of his Honour Judge Edge, sitting at the Clerkenwell County Court, in an action brought to recover £10 1s. 3d. for arrears of gas supplied to premises at 388, Harrow Road, to the then tenant, Mr. Lowles, who carried on the business of a grocer with an off-licence for the sale of wines, spirits, &c.* The question, it may be remembered, turned upon section 18 of the Company's Act of 1872, which provides that "in case any consumer leaves the premises where the gas was supplied to him without paying to the Company the rate or meter-rent due from him, the Company shall not require from the next tenant of the premises payment of the arrears so left unpaid, unless the incoming tenant shall continue the trade or business of the outgoing tenant, and shall have paid to the owner, lessee, or mortgagee in possession, or to the outgoing tenant of such premises, a consideration for so doing." The tenant being in arrear for goods supplied to him and on the mortgage, the latter was transferred to the Cannon Brewery Company, who, the plaintiffs alleged, were liable to pay the preferential creditors.

Mr. DANCKWERTS, K.C., and Mr. VAUGHAN WILLIAMS appeared for the appellants; Mr. A. H. SPOKES represented the respondents.

Mr. VAUGHAN WILLIAMS having shortly stated the facts and read section 18,

Justice DARLING asked what the words "for so doing" applied to.

Mr. VAUGHAN WILLIAMS said they must apply to going out.

Justice DARLING: I should have thought they applied to continuing the trade.

Mr. VAUGHAN WILLIAMS submitted that the transactions between Lowles and the Brewery Company were such as to bring the defendant Company within the words of the section. After referring to the case of the *Gaslight and Coke Company v. Mead*, on which the County Court Judge had based his decision [that the Gas Company could not sue the incoming tenanl for the debt of the outging tenant],

The LORD CHIEF JUSTICE asked how the appellants distinguished this case from that.

Mr. VAUGHAN WILLIAMS said he relied upon the construction put upon the Act by Lord Justice Rigby, in the case of *Paterson v. Gaslight and Coke Company*, in 1896.

The LORD CHIEF JUSTICE remarked that the only point there was whether "successors" came within the terms of the section, not whether they could be made to pay for gas which the previous tenant had used.

Justice DARLING thought Lord Justice Rigby, in the remarks he made, was dealing with the case where the incoming tenant wished to have a supply of gas.

Mr. VAUGHAN WILLIAMS said the Company could say: "If you want a supply, you must pay the arrears of the outgoing tenant; if you do not pay them, we are entitled to treat you just as we should be entitled to treat the outgoing tenant, and say we will not supply you unless you pay up the arrears."

The LORD CHIEF JUSTICE; What Lord Justice Rigby said may be perfectly true with reference to a person who comes within the description of the section, who desires to have a supply of gas; but if the person, as here, does not desire a supply, you have to show that he comes within some section that gives you the right to sue.

Mr. DANCKWERTS criticized at some length the language of the section, and contended that the Court was bound by the decision of Lord Justice Rigby, and that therefore the appeal should be allowed.

Without calling upon Counsel for the respondents,

The LORD CHIEF JUSTICE proceeded to deliver judgment. He said he was of opinion that the decision in Mead's case was exactly in point, and was binding on them. The ground on which they were asked not to follow it was that it had been substantially overruled in Paterson's case by Lord Justice Rigby. But, having carefully considered that case, he could not see anything which would indicate the line of thought which was necessary for dealing with Mead's case. Lord Justice Rigby appeared to be dealing with the case of a person who, as Receiver of the Court, or the successor in business, continued to receive a supply of gas; and he said this would make him liable "to pay for the arrears of gas supplied to the business, as well as for the continuing supply, at the same time entitling him, under ordinary terms, to such a continuing supply." Whatever might be said by way of criticism of Mead's case, it was impossible to treat the observations of Lord Justice Rigby otherwise than as *obiter*. They were not a decision on the point, and did not overrule Mead's case.

Justices DARLING and CHANNELL concurred.

The appeal was therefore dismissed with costs; but leave to further appeal was given.

* See *ante*, p. 95, and Vol. LXXVIII, p. 1673.

WESTMINSTER COUNTY COURT.—Wednesday, April 9.

(*Before His Honour Judge* WOODFALL.)

Pzara v. Gaslight and Coke Company—Incoming and Outgoing Tenants.

This was an action to recover the sum of £4 13s. 10d., which had been paid to the defendants under protest on behalf of the plaintiff.

Mr. SAUNT appeared for the plaintiff; Mr. NEILSON represented the defendants.

Mr. SAUNT, in opening for the plaintiff, referred to the case of the *Gaslight and Coke Company v. Lee*, which, however, was the converse of the present one, inasmuch as it was a claim by the Gas Company, whereas this was for the recovery of money already paid. The money in dispute was the same in both cases—viz., arrears left by an outgoing tenant, and claimed by the Company from the new one.

Michael Pzara, the plaintiff, was called and said he carried on business as a wholesale tobacconist at 259, Cambridge Road, Mile End. About the end of 1901, he purchased the tobacco and hair-dressing business of Barnet Pzara, a relative, at 42A, Stamford Hill. He accordingly sent a notice to the Gas Company to inform them that he was going to continue to take gas from them. The assignment of the lease to witness did not contain any reference to arrears. On the 28th of January the Company's men came to cut off the gas, owing to the non-payment of the preceding tenant's arrears, and witness's brother, who was in charge, paid the money under protest. He did not know that, if he did not pay his predecessor's arrears, the gas would be cut off.

Mr. NEILSON submitted that as the incoming tenant had paid the outgoing one consideration for the business, he was clearly liable for his predecessor's arrears, under section 18 of the Company's Act of 1872. By that Act, they were entitled to cut off the supply to an incomer who refused to pay the outgoer's arrears. The Company then had a case pending in the High Court of Justice which dealt with that point.* The case of Lee, on which his friend relied, differed from the present one.

Mr. SAUNT contended that on another point his client was not liable. The Company supplied Michael Pzara from the 1st of January to the 4th of February, and in consequence there was an implied contract between the parties. At first they had a claim on the plaintiff, for they had power to cut off his gas; but they lost this claim by supplying him for a month, and thus entering into an implied contract.

His HONOUR: I thought you had no case; but this new point alters things. I do not think it has been discussed before in any of the cases on the subject.

Plaintiff, recalled, said he did not know whether or not the outgoing tenant gave the Company any notice; but he himself went to the offices on the 2nd of January, and there told a representative that the Stamford Hill premises had changed hands. At the same time he ordered a new gas-stove, which the defendants' men fitted the following day. He himself posted the letter acquainting the Company with the transfer of the business; and if it had not been delivered he could not understand it.

Mr. *Vickers*, Senior Inspector in the employ of the Company at the Palatine Road office, deposed to sending someone to plaintiff's premises on the 28th of December to inspect the meter. Plaintiff subsequently called about the gas-stove, but did not say anything in regard to a transfer of the business.

By his HONOUR: In every case the Company had a written contract from the consumer, although this was not required by the Act. They did not have one from plaintiff until the arrears were paid—they did not ask for one before. The reason the Company waited for 26 days or so before claiming from the plaintiff was that they were trying to get the money from the outgoing tenant.

It was pointed out to his Honour that the contract signed on Feb. 4 was pre-dated for Dec. 28, the date of the transfer.

After hearing Counsel on the new point,

His HONOUR said it was an interesting case, because on the second point, which had not been raised before, section 18 of the Company's Act was not very clear; but it was clear enough for the purposes of the present action. It provided that, in the event of an incoming tenant continuing the trade or business of the outgoing tenant and paying him a consideration, the Company should not be under necessity to supply him with gas unless he paid the arrears. He (his Honour) had no doubt that the plaintiff came within the terms of the section; but the other point had caused him some doubt. It seemed to him that if he held that it was not the Company's right to apply to the new-comer after some time—after they found they could not get their money from their rightful debtor—he would be defeating the object of the privilege given them. If, instead of doing as they had done in the present case, they said to an incoming tenant: "Now, before you have any gas you must pay these arrears," that would seem a very high-handed action for the Company to take. But they tried first to get the money from the outgoing tenant. Mr. Vickers had said that the reason they had waited was that they always had a contract, although that was not necessary under the terms of their Act. Until they had that written contract, they did not look upon a consumer as the person with whom they were dealing. It was not unreasonable that they should try first of all to get the money from the outgoing tenant. The fact that the money was paid under protest (which he did not doubt) did not affect the case. There must accordingly be judgment for the defendants.

Mr. NIELSON asked for costs on the higher scale, as the case affected a large number of people.

His HONOUR however declined to grant them.

The Dawlish Acetylene Explosion Case.

In the King's Bench Division last Wednesday, the Lord Chief Justice and Justices Darling and Channell had before them an appeal by the plaintiff in the case of *Davey v. Willey and Co.*, from the decision of Judge Woodfall in the Exeter County Court. A report of the action (which was brought under the Employers' Liability Act) appeared in the "JOURNAL" for Dec. 10 last (p. 1539). Judge Woodfall non-suited the plaintiff, on the ground that there was no evidence of defect "of the machinery connected with the business of the employers;" and, without calling upon Counsel for the respondents, the Judges of the High Court gave judgment to the same effect, and dismissed the appeal, with costs.

The Liability of Gas Companies.

In the King's Bench Division of the High Court of Justice, Mr. Justice Lawrance and a Special Jury were occupied last Wednesday and Thursday in hearing the case of *Leach v. South Metropolitan Gas Company*. It was an action brought by George Leach, a marine store dealer, of Bermondsey, against the Company, for damages for personal injuries caused to him by their alleged negligence or by that of their servants. The accident occurred on the 3rd of October last, when the Company's servants were excavating in Union Road, Bermondsey, for the purpose of re-laying a main. Mr. Dodd, K.C., appeared for the plaintiff; Mr. Horace Avory, K.C., represented the defendants. The evidence showed that one of the defendants' men was chipping the old pipe with a hammer and chisel; and just as the plaintiff came out of a public-house near, a splinter of the pipe struck him in the eye, which was very much hurt, and remained sore for several weeks, though it did not appear that the sight was injured. After a long hearing, the Jury found a verdict for the plaintiff for £25. Mr. Dodd urged that, in point of law, the defendants were liable. By the Gas-Works Clauses Act, the Company were bound to make good any "damage" they caused; and he contended that this word meant damage either to property or to persons. Mr. Avory submitted that the Act in question had no application at all to injury done to persons. It provided that the Gas Company might open up the streets, &c., doing as little damage as possible in the execution of their work, and making compensation for any damage done. There was no decision that he knew of to show that the damage referred to in the section applied to persons as well as to property. The Court of Appeal, had, moreover, decided that even in the case of injury to property, the remedy under the section was not by action, but by arbitration in the manner provided by the Act. His Lordship agreed to this line of argument, and gave judgment for the defendants.

Gas Profits at Dewsbury.—A year ago, the profits from the gas undertaking of the Dewsbury Corporation amounted to upwards of £4000; and £2500 was applied to the relief of the general district rate. For the year just ended, owing to the high price of coal and the diminished receipts for residuals, the profits were considerably less than they were twelve months ago, and only £1500 has been transferred to the district rate account.

Robbery at the Loughborough Gas Offices.—On Monday morning last week, a discovery was made that the offices of the Loughborough Corporation Gas Department had been entered by burglars, and about £80 stolen from a safe, which had been broken open. At the meeting of the Corporation the next day, Alderman Bumpus referred to the loss, and said the matter was in the hands of the police. He asked the members of the Gas Committee to sit for a short time at the close of the meeting. Alderman Godkin thought the members of the Council would like to know how it was that £80 was left to be stolen, when it could have been put into the bank. A good many of them thought it was a point worth consideration. Alderman Bumpus replied that the matter would be considered by the Committee, and what had occurred would be reported upon.

Winsford Gas Supply.—At the last meeting of the Winsford Urban District Council, the Gas Manager (Mr. F. Sidwell) submitted a report, which showed that since the acquisition of the gas undertaking by the Local Authority it had proved in every way successful. He stated that for the half year ended the 31st of March, the quantity of gas made was 11,345,900 cubic feet, to produce which 1022 tons of coal had been used. This averaged 11,090·81 cubic feet per ton, against 10,250 cubic feet last year. During the six months, the increase in the gas produced was 600,000 cubic feet. The total quantity used in the December quarter was 4,022,300 cubic feet, and in the March quarter 3,701,500 cubic feet. The public lamps had been responsible for 1,314,300 cubic feet, and gas-engines for 360,000 cubic feet; while 1,947,800 cubic feet had been lost through leakages caused by subsidence of mains. This was equal to 17·16 per cent., against 25 per cent. for the corresponding period last year. The receipts for gas would be £1807. There were 42 new consumers, and 70 gas-cookers and 30 gas-fires in use. The members commented favourably upon the satisfactory nature of the report.

Departmental Profits at Bolton.—At the last monthly meeting of the Bolton Town Council, the following paragraph appeared on the minutes of the Finance Committee: "That the yearly contributions of the gas, tramways, and electricity undertakings in aid of the rates should not be less than 2½ per cent. on the existing loan capital, as on the previous 31st of March; any balance of profit being carried to the reserve fund." Mr. Panton, in calling attention to the matter, said he understood that the departments named were never to be expected to contribute more than 2½ per cent. on the capital to the relief of rates—a principle which he held to be very beneficial, inasmuch as it would permit of them allocating sums to depreciation and renewal, which would place them upon a sound basis. The Chairman of the Committee (Mr. Walmsley) explained that what was asked was that the departments should do their best to provide 2½ per cent. at least. They only wished that a businesslike basis should be established. If the price of commodities would not provide for 2½ per cent., then there should be an increase in the charge for the gas, water, or whatever it might be. The paragraph was altered to read that the undertakings referred to should be "expected" to yield 2½ per cent. on the existing loan capital, and that any balance of profit should be carried to reserve fund; and in this form it was passed.

* The case alluded to will be found reported on the last page.—ED. J.G.L.

MISCELLANEOUS NEWS.

POULTON GAS ARBITRATION.

SURVEYORS' INSTITUTION—Wednesday, April 9.

This was an arbitration to assess the sum to be paid by the Poulton Urban District Council to the Poulton Gas, Lime, and Coke Company for their undertaking, under the Act of 1901. Mr. THOMAS NEWBIGGING was the Arbitrator for the Company, and Mr. W. A. VALON for the Council. Mr. ERNEST MOON, K.C., officiated as Umpire.

Mr. HONORATUS LLOYD appeared as Counsel for the Company; and Mr. C. C. HUTCHINSON represented the Urban District Council.

Mr. HONORATUS LLOYD, in opening the case on behalf of the Company, said the works were originally started and carried on as a private undertaking; and in 1885 a limited Company was formed with a capital of £5000. The actual purchase money was £1800. In the autumn of 1887 a Provisional Order was applied for, which put the Company on a statutory basis. The area of supply was the township of Poulton and parts of the townships of Thornton and Carleton. The capital was limited to £12,000—£5000 original capital and £7000 additional. The standard dividend was fixed at 10 per cent. on the original capital, and 7 per cent. on the additional; while the borrowing powers were fixed at one fourth of the capital actually raised. The standard price of gas was 5s. 10d.; but the actual charge at the present time was 3s. 9d. The usual provisions were made with regard to the sliding-scale. The form of the clause giving power to the Local Authority to purchase in certain events was unique. Negotiations had taken place between the Committee of the ratepayers of Poulton and the Directors of the Company, and the form of clause was agreed upon. Among the demands of the Committee, was one for a purchase clause, simply in the form that they should be at liberty to purchase the undertaking upon terms to be agreed upon or settled by arbitration in accordance with the provisions of the Public Health Act. The Directors at that time were anxious to make it quite clear that, if the power of purchase were exercised, the Company should get back at any rate the amount they had actually expended on capital account; and therefore they altered the clause submitted to them by the Ratepayers' Committee into that form—stating what should be paid. The undertakers had no desire to sell their property; but no doubt it would be contended that the present was a sale by agreement, and that therefore no allowance should be made for compulsory purchase. The Directors were threatened with opposition, and had no option but to accept the clause. In 1900, the Council gave notice of their intention to exercise their power of purchase; and as the Local Government Board could not give powers with regard to the townships of Thornton and Carleton, a Bill was promoted in Parliament (which became the Act of 1901), under which the arbitration was taking place. Clause 5 of the Act said the Council should pay such consideration as would represent: "(*a*) The money expended by the Company on capital account in connection with the undertaking, together with (*b*) such additional sum of money as may be mutually agreed upon between the Company and the Council, or, in case of dispute, may be awarded by arbitration." Substantially, that was the same as the Order. On Oct. 19, 1901, the Council gave notice that they were prepared to proceed with the purchase, and requested the Company to send in their claim. The Company were not in a position at that time to send in a valuation; and thereupon the Council gave notice to appoint an arbitrator.

Mr. HUTCHINSON contended that the arbitration only took place with regard to sub-clause *b*.

Mr. HONORATUS LLOYD dissented from that view, but said that an agreement had been arrived at as to the sum which should represent sub-clause *a*—viz., £8208 4s. 4d. Therefore what the Arbitrators had to decide was the additional sum, under sub-clause *b*, which was to be paid. The Company had been, and was likely to be, extraordinarily successful. Poulton had a population in 1891 of 1412, which increased to 2223 in 1901. The number of houses rose in the same period from 324 to 613; and the rateable value from £8500 to £14,000. In addition to Poulton, the Company were in negotiation with Thornton for supplying them when the question of the purchase came up. At the price of 3s. 9d. per 1000 cubic feet, if the Company had earned the money, they could have paid, under the sliding-scale, 16¼ per cent. on the original capital and 13¼ per cent. on the additional capital paid up, representing £1117 5s. The capital expenditure up to Dec. 31, 1901, was £10,008 4s. 4d. Deducting the mortgage, £1800, this left £8208 4s. 4d. Counsel proceeded to deal with the method adopted to arrive at a normal year, taking into consideration the abnormal price of coal, &c., which was later explained by Mr. Jones.

Mr. HUTCHINSON submitted that, under the purchase clause, the valuation on a commercial basis was altogether precluded. No allowance should be made for goodwill or the right to supply, inasmuch as, when the Company embarked upon their operations in 1888, under the Order, they entirely parted with their right to supply the district in perpetuity. The position they were in was that of mere licensees of the Local Authority, having the monopoly of supply for seven years certain. Therefore the profits of the undertaking were not within the purview of the arbitration at all. Counsel cited the cases of the Edinburgh Tramways Company and the Edinburgh Corporation, and the Metropolitan Tramways Company and the London County Council, in support of his contention. What the Council had to pay for was the whole of the pipes, mains, fittings, and apparatus—not the price which they were worth to the Company to-day, but the actual amount they had expended upon them. The value to be placed upon sub-clause *b* was that the Arbitrators were to consider whether the Company had, during the time the undertaking had remained in their hands, enjoyed a fair rate of interest, having regard to the fact that, so soon as the option to purchase was exercised, theirs became a gilt-edged security.

The UMPIRE said the argument would be considered; but the evidence would not be stopped at that stage.

Mr. *Benjamin Sykes* was the first witness called. In answer to Mr. LLOYD, he said he was familiar with the district, the population of which had increased about 60 per cent. in the last ten years. He gave particulars with regard to building in the neighbourhood, &c., tending to show the growth of the place and the great prospective value of the undertaking of the Company.

Mr. *H. E. Jones*, M.Inst.C.E., said that in the last four years the whole of the works had been practically rebuilt, and the carbonizing plant had been put upon the most modern lines. Its capacity was equal to double the duty at present devolving upon it. There was an abnormally large annual growth, quite unprecedented in fact. In 1896, there was a sale of 3,317,000 cubic feet of gas; in 1897, over 4,400,000; and in 1898, over 5 millions. Another point to which he referred was the power to supply outside districts. He had dealt with the matter under the Lands Clauses Act, seeing nothing which prevented the full value of the undertaking being considered. The Company in the course of a very short time would be enabled to supply double the present demand, with a certain capital expenditure with regard to the supply of the outlying districts. The total amount which could be divided among the Company's shareholders was £1117 5s. The earnings on the output in the year 1905 alone would represent a surplus amount of profit of £650 greater than in a normal year. In order to arrive at a normal year, he had taken the price of coal at 11s. per ton and coke at 8s. 6d. per ton. This gave 1s. 2d. as the cost of coal per 1000 cubic feet of gas, from which he deducted 5·36d. for coke, 2d. for tar, and 1½d. for ammonia; leaving the net cost of coal per 1000 cubic feet of gas at 5·14d. This was the figure which should be applied for giving a normal year. He had further considered the outlay for working expenses, and put them down at 17d. The total expenses, 22·14d., deducted from the gross profit, 47·04d., left a balance of 24·9d. as the profit per 1000 cubic feet. This, on the sale of 7½ million cubic feet in 1901, gave a profit of £788 10s., which represented the true amount in a normal year. A sum of £66 10s. must be deducted from this amount, leaving £722, which he had taken at 28 years' purchase. He had never taken less for statutory undertakings, which were in all respects in good condition. Multiplying £722 by 28 gave £20,216. To this must be added the prospective profits lost to the shareholders, as follows: Taking the increase in the sale of gas at 19 per cent., the annual sale of gas and additional profit would be—

	Cubic Feet.		£ s. d.
To June, 1902	8,525,000	..	64 0 0
,, 1903	10,145,000	..	226 0 0
,, 1904	12,072,000	..	418 14 0
,, 1905	14,365,900	..	648 6 0

The total extra profit on the four years would thus be £1357, averaging £339 5s. per annum, and reaching in the fourth year £648 6s. At 28 years' purchase, this would give a sum of £18,144; but as the full amount was not realized until four years from the present date, this should be deferred on the 4 per cent. basis for four years, which reduced the amount to £15,513. Added to £20,216, this gave a grand total of £35,729. The works for the most part being equal to double the present duty, to meet this extra business there would only be needed an expenditure of about £2000 on retorts, mains, services, and meters. Deducting this, the net value was £33,729, and adding 10 per cent. for compulsory sale, £37,101.

In cross-examination by Mr. HUTCHINSON, Mr. Jones said, upon the basis of the gas sold at present, this sum would represent about 4½ times the capital value.

Mr. HUTCHINSON: Have you ever known an instance of a commercial undertaking where there was such a disproportion between the amounts?

Witness: No; because I have never known a similar case of an undertaking having works which can cope with double the present output, and with an output doubling itself in four years, and with another business, which it can obtain, on the expenditure of £2000, by going into another neighbourhood over which it has statutory power.

Did you ever know of a case in which a sum of £5000 per million cubic feet of gas sold was awarded?—No; because I do not know of a similar case.

In answer to further questions, witness said that the total storage capacity at present was 48,000 cubic feet, which was equal to an output of 60,000 feet. It used to be the practice to have 100 per cent. holder capacity; but it was not so now, on account of the large amount of gas consumed during the day for cooking and fuel purposes. The maximum daily amount made in 1901 was 38,000 cubic feet.

Mr. HUTCHINSON: I put it to you that it is 42,000, and double that is 84,000. Your holders will not suffice for that?

Witness: One is ready for putting a second left in, I understand, in which case the cost would be, taking the 76,000 cubic feet, about £28, if I am mistaken, the amount would be perhaps £250.

Witness was further examined as to the various portions of the work. He stated that six or seven retorts were required for a maximum day's make and denied that both the sets of retorts were ever used.

Mr. *Samuel Wood*, of the firm of Messrs. Lass, Wood, and Drew, was called to prove the figures supplied on behalf of the Company.

Mr. *Robert Porter*, Manager of the Elland Gas-Works, said the Company had considered their future prospects and provided for them in their works. He agreed with Mr. Jones with regard to the capacity of the works and generally as to the position of the Company. All the works were in excellent condition, and the present income was amply secured. In addition, there was the prospect of a splendid future. Taking the account year, the net profit had been £603 2s. 1d. To this, he added the profit on fittings, £23 1s. 7d., and net amount for coal, 3·73d., which amounted to £130 7s. 6d. He also added £756 11s. 2d. for prospective profits, making a total of £1513 2s. 4d. The amount of dividend the shareholders were entitled to at the present price of gas was £1117 5s., which he capitalized, on the 3½ per cent. basis, at 28·57 years' purchase. This gave a total of £31,919, to which he added £3191 (*i.e.*, 10 per cent. for compulsory sale), making £35,110. Deducting £2000, the cost of additional works, the net amount was £33,110. His structural valuation came to £11,128 10s. 2d.

Friday, April 11.

Mr. Jones was recalled, and made certain corrections in the figures supplied on Wednesday, which had the effect of reducing his valuation by about £3000.

The original clause with regard to purchase as submitted by the Ratepayers' Committee, and the clause as altered by the Company, were produced, in order to decide the point as to whether the amount of capital expended was to be the minimum sum to be awarded to the Company, *plus* a further sum for goodwill, as contended by the Company, or practically the maximum amount, as urged by the Council.

This concluded the case for the Company.

Mr. HUTCHINSON, in opening on behalf of the District Council, submitted that both Mr. Jones's and Mr. Porter's valuations were founded upon a basis which was non-existent in fact, and wholly fictitious. It had been held, both by arbitrators and by Parliament, that prospective value of the kind suggested, even if it were otherwise legitimately due as between the parties, was not a right and proper thing to be taken into account. In support of his contention, the learned Counsel cited the Aldershot Gas and Water Bill of last session. Both Mr. Jones and Mr. Porter agreed that, where a gas undertaking was valued upon a commercial basis, every single sixpence outside the sum which represented capital was goodwill, and had to be attributed to the use of statutory powers. In the statutory powers was always included the sum of money which had been expended in order to obtain them. By clause 5, the Council were to pay the capital sum agreed upon—£8208 4s. 4d. —for moneys expended by the Company on capital account " in connection with the undertaking." The interpretation clause was as follows: " The undertaking of the Company includes all the gas-works, engines, mains, pipes, machinery, lands, buildings, fixed and movable plant, and all other, the real and personal property, assets, effects of whatever nature, and all the rights, powers, and privileges vested in or belonging to or enjoyed by them." Mr. Jones had failed to take into account that, as the £8208 actually included the sum paid by the Company in obtaining their statutory powers, he was asking the Arbitrator to assess this sum again. Both the experts' valuations depended almost entirely upon the net price of coal; and another factor which they laid stress upon was the increase in the quantity of gas sold. His witnesses would show that, though there had been such increase, the growth had decreased during later years. Now that the clause as originally drawn by the Ratepayers' Committee, and the clause as altered by the Company had been produced, he thought it was conclusively shown that the bargain between the two parties never contemplated for a moment that anything should be paid by way of goodwill in the exercise of the statutory powers. Up to 1889, not a farthing of dividend had been paid by the Company. In the return submitted, it appeared that 5 per cent. was the average dividend for the three years ending 1889; but, as a matter of fact, 1889 was the first year in which any dividend was paid.

Mr. LLOYD denied the statement, and submitted that Mr. Wood should have been cross-examined upon the point.

Mr. HUTCHINSON (continuing) said that the principle of compensation, whether with regard to lands or to an undertaking enjoying statutory powers, was not that the tribunal should determine the value to the buyer of that which was acquired, but to the seller. Both of the experts' valuations dealt with the value in the future to the buyer, and were therefore on a wrong basis.

The UMPIRE asked under what circumstances sub clause (*b*) would come into operation, according to Mr. Hutchinson's contention.

Mr. HUTCHINSON replied that if the average income had been insufficient, it might be made up to 5 per cent. As a fact, the average dividend was 5·3 per cent.; and having regard to the security of the capital, he submitted that the shareholders had been sufficiently remunerated. If the price were determined upon the basis of commercial value, the tribunal must only award that which a buyer in the market would give, having regard to the fact that there was no fixity of tenure, and no perpetuity.

Mr *Thomas Blane*, chartered accountant, of Blackpool, proved the figures supplied on behalf of the Council. The profits shown in Messrs. Lass, Wood and Co.'s statement were agreed to; but there were differences with reference to the allocation of sums to repairs and maintenance, which the witness proceeded to explain in detail.

Mr. *E. H. Stevenson*, M. Inst. C.E., said he had inspected the works of the Company. Generally speaking, they were not in a bad state. There was a considerable area of land over which the Company had no power to put up works; and therefore the site was very cramped. The works were not sufficient for any considerable extension. The retort-house was exceedingly old, and the roof was in bad repair. No claim ought to be made for an undertaking except in so far as the existing works, with their proper margin of safety, were able to carry on in the future. The condenser was about the right size; but the scrubber was practically of no use. The condenser and scrubber were really nothing more than pipes through which the gas went. He considered the omission of the necessary apparatus an important thing. There were two exhausters—one nearly new, but the other a mere toy, which ought never to be used except in midsummer. The purifiers were good, and considerably in excess of present requirements. In regard to storage accommodation at the works, there were two gasholders, with a capacity of 19,000 and 26,000 cubic feet respectively, With the addition of another lift, the holder capacity could not be doubled. A new lift would only give about 25,000 cubic feet capacity, which would bring the total storeage up to 70,000 cubic feet. The present maximum make of gas was 42,000 cubic feet. This was not a district where much gas would be used during the day. There were only 33 cooking-stoves; and therefore the proportion of daily consumption was small. The average increase in the consumption of gas was perfectly correct as given in the Company's accounts; but it was a curious fact that the first twelvemonth's increase of the five years taken was 30 per cent., while in the last year it was only a little over 12 per cent. Therefore it was a decreasing increase. He thought 19 per cent. increase was not to be expected in the future. The purchase clause was unique. It certainly did not contemplate that the arbitration should take place upon the usual basis of commercial value. The object of the clause was that the Company should get back at any rate the amount they had actually expended upon capital account. Having regard to the fact that the capital was secured, he considered that 5 per cent. was very fair interest. At the time the bargain was made, it was an exceedingly good one for the Company. It was, however, not so good to-day. He had prepared a commercial valuation. The profit, as shown in the accounts, was £603 2s. 1d. The net cost of coal in 1901 was 9·88d. and the corrected cost for 1899 7·22d. per 1000 cubic feet, or a difference of 2·66d. Taking 7,613,000 cubic feet of gas, this difference represented £84 7s. 6d., making a total revenue of £687 9s. 7d. The deductions he made were £131 10s. 7d., which left a corrected profit of £555 19s. 10d., from which he deducted interest on mortgage £66 10s.—making a total of £489 9s. He had taken 25 years' purchase of this, which was £12,236 5s., and added three years' profits from fittings (£69 4s. 9d.), making a total value of £12,305 9s. 9d., as against Mr. Jones' valuation of £30,270. As £8208 was an agreed figure, the total sum on the commercial basis for sub-clause (*b*) was something over £4000.

Mr. HUTCHINSON: Suppose this were a concern about to be purchased by another profit-earning company or other body, having regard to the effect of the purchase clause, what would you think would be a fair sum to represent the goodwill value?

Witness: The outside I should put it at would be a year's purchase—not so much, because I should expect my client to receive some profit.

Mr. LLOYD (in cross examination): You do not rely here upon there being a period fixed during which the purchase may be carried out?

Witness: No.

You rely upon the nature of the purchase clause—its not being an open clause?—Yes. That does not affect the answer I gave to Mr. Hutchinson.

Do you know the form of clause which the Ratepayers' Committee originally asked for?—Yes. They asked for the Public Health Act.

The proposal originally was that they should buy on commercial value?—Yes.

It is equally clear that the intention and proposal of the Company was also to get commercial value?—Yes; if they could.

The Ratepayers' Committee thought they would get the undertaking cheap by putting it at commercial value?—Yes, probably; but neither party intended commercial value at the end.

Witness was further cross-examined upon his valuation, which he said had only been prepared on the previous day. Before that he had not thought it necessary to make one, as all that should be paid was the capital expended. Sub-clause (*b*) was only intended to be applied supposing the dividend paid was small, which was not the case. He heard Mr. Jones say that £2000 was sufficient to increase the works to double their present capacity (this morning corrected to £2500); but he did not think this was worth attention, where the profit had to be earned by the expenditure of other capital. He had discarded the whole thing, and had not considered to this moment what the extensions would cost.

Mr. *Charles Gott*, M.Inst.C.E., agreed generally with the evidence given by Mr. Stevenson. In his opinion, the outside districts could not for some years to come be supplied with gas at a profit. It was a very large area; and the maximum expenditure would have to be incurred in order to sell gas there. Owing to the capital which would have to be introduced into the undertaking to bring the outside areas within the field of the Company's operations, the profits made would be required to furnish interest. This was probably the explanation of the Company never having extended their mains into the outside districts named in their Order.

Saturday, April 12.

Mr. HUTCHINSON to-day summed up the evidence on behalf of the Urban District Council, enforcing those contentions which he had already addressed to the tribunal. The Company, he said, had no right to supply gas vested in them. Upon the Local Authority coming into existence the right of supply immediately vested in them. Therefore, strictly speaking, the Company were not entitled to receive anything more than the capital they had expended.

Mr. HONORATUS LLOYD addressed the tribunal on behalf of the Company. He said Mr. Hutchinson's main contention was that, as the purchase clause limited the time within which the sale should take place, the Company had no right to supply. The ordinary purchase clause was unlimited as to time; and the special clause therefore really limited the Council and not the Gas Company. The matter really depended—not on the time, but on the terms on which the purchase was to take place. In the ordinary purchase clause, the valuation was upon a commercial basis. That the clause should be inserted in the Provisional Order was undoubtedly a bargain between the representatives of the ratepayers and the Company. Having dealt fully with the question as to what was the intention of the parties, the learned Counsel proceeded to comment upon the valuations of the experts, and contended that when Mr. Stevenson's was corrected in certain particulars (as it should be), there was no very great difference between it and those of Mr. H. E. Jones and Mr. Porter.

This concluded the case. The decision of the Arbitrators will be given in due course.

Free Gas for Coronation Illuminations.—The Middlesbrough Town Council have agreed, on the recommendation of the Gas Committee, that anyone applying for a supply of gas for illumination on Coronation Day shall be allowed to have it free. Mr. Carey objected to this being done, on the grounds that the financial condition of the gas-works did not warrant it, and that people would not be showing their loyalty by burning gas which they obtained for nothing. His amendment was, however, lost by a large majority.

Leigh Gas, Water, and Electricity Departments.—A proposal was made at last week's meeting of the Leigh Town Council that the Gas and Water Departments should be separated from the Electricity Department, on the ground that the work of the two departments required a tremendous amount of supervision, and that the Gas Manager (Mr. John Foster), though anxious to do his best, would be unable to superintend everything. Alderman Pennington opposed the suggestion, and said that while the work was being done satisfactorily he did not see that they should spend £300 or £400 extra. Mr. Shaw thought that as Mr. Foster was a Gas Manager, he would look after gas before electricity. If the departments were separated, there would be competition, and there would be better gas and better electricity. The Council, however, rejected the proposal by 19 votes to 6.

PUBLIC LIGHTING OF THE CITY OF LONDON.

Incandescent Gas-Lights in the Side Streets.

At the Meeting of the Common Council of the City of London last Thursday, the question of lighting the side streets of the City was advanced a stage by the Streets Committee recommending for acceptance a tender of Messrs. S. Pontifex and Co. for supplying and fixing new gas-lamps, fitted with incandescent burners, in the following thoroughfares, at the sum of £1005: Streets west of Farringdon Street and New Bridge Street to the City Boundary, streets between Foster Lane and King Street, Finsbury Circus, East Street, West Street, Circus Place, Stationers' Hall Court, and New Court, Farringdon Street, subject to a time limit of three months from the date of the issue of the order to commence the work. The recommendation was agreed to. The Committee stated that they had given instructions for improving the lighting of Salisbury Square by substituting for the existing five-light gas-column a Sugg's "Westminster" lantern, with triple incandescent burners, at an estimated cost of £10. They further recommended that the existing gas-lamps in Telegraph Street and Copthall Buildings be fitted with incandescent burners, and five additional lamps fixed thereat, at an estimated cost of £54; that twelve new lamps, fitted with similar burners, should be fixed in the streets in the neighbourhood of College Hill, at an estimated cost of £50; and that it be referred back to the Committee to obtain tenders and carry out this work. The recommendation was agreed to.

MANCHESTER CORPORATION GAS DEPARTMENT.

The Gas Committee and Sick Workmen.

At the Meeting of the Manchester City Council last Wednesday, the Gas Committee submitted to the Council a proposed instruction to the Engineers and Managers of the several gas-works, including the Street-Mains Department, that in all cases in future where workmen are injured and unable to resume their duties within a reasonable time—say, fourteen days—they must be given the requisite notice in writing to terminate their services with the Committee. The Chairman (Alderman Gibson) said this perhaps appeared to be a formidable resolution, but really it was not so. The Committee had arrived at it owing to circumstances which came to their knowledge. Workmen were staying away from their duties when they could really be discharging them, simply because their wages and sick club allowances combined produced a larger income than they received when at work. The proposal had already had a marked effect, and had brought back a couple of men immediately. Mr. F. Brocklehurst considered the explanation a good and fair one. With respect to the lamplighters' position, he might take some action on a future occasion. Mr. Sutton moved, as an amendment, that the proposed instruction be referred back to the Committee. He thought it would be absurd to pass such a resolution; and it would set a bad example to other employers. They had it in their power, when any doubt arose as to a man being unfit for work, to demand a doctor's certificate. Dr. Dreyfus seconded the amendment, remarking that the suggested instruction was very drastic, and likely to cause considerable hardship. Mr. Lambert said the resolution would not affect the position of workmen under the Compensation Act. If a man met with an accident while discharging his duties, he had a remedy under the Act, and no resolution could affect it. If, on the other hand, he was absent through sickness, he could remain away from his work, if his sickness continued for three or six months; and unless his contract with the employer was terminated by formal notice, the employer continued liable for the man's wages. The Committee simply wished to protect the Corporation against claims of that kind. Alderman Gibson said he should like to alter the word "injured" in the recommendation, as it was not injured workmen who were referred to. Ultimately, the proposal was referred back.

OWNERSHIP OF THE DALTON GAS-WORKS.

According to the Dalton-in-Furness correspondent of the "Yorkshire Post," there is trouble brewing in the town, arising out of one of the conditions peculiar to the place, which has its parochial affairs managed by a body known as "The Four-and-Twenty of Dalton." The dispute now occupying public attention concerns the future of the gas-works which supply the urban district, with certain outlying exceptions, but are at present the property of nobody, though technically they are owned by the "Owners of property, ratepayers, and gas consumers of Dalton Proper." They have never paid a dividend, and have cost the town nothing; the price of gas being controlled by the expenditure necessary for the manufacture of gas and the upkeep of the works. The object of the movement now on foot is to transfer the undertaking to the Urban District Council.

The history of the works dates back to 1852, when the Furness Railway Company purchased a plot of town land known as Mary Bank, for £700; and the vestry meeting decided that the remaining portion of the parcel of land, with the £700, should be applied to the provision of gas-works for Dalton Proper. As the town developed, an outlay which even the income from gas sold at the price of 8s. 4d. per 1000 cubic feet could not meet, was required The twelve members of the Dalton Gas Committee borrowed £800 from the Lancaster Banking Company; and this has now been paid off out of the revenue of the works. So excellently have they been managed by the Committee, which is elected by rotation (three out of the twelve retiring in order), that the works, now valued at some £4000, are free; and the price of gas, with but a small consumption, is only 2s. 9d. per 1000 cubic feet. It was nearly 30 years ago that the first movement was made to have the works transferred to the Local Board; and the negotiations proceeded as far as a valuation and draft agreement. But this arrangement fell through, as did also a proposal to form a limited liability Company in 1875. Various schemes were suggested from time to time at intervals of a few years; but all with the same result. In 1889, the townspeople took steps which resulted in the annual meetings of the Management Committee being attended by anybody who cared to go, instead of by property owners and gas consumers only. Then the "old hereditaments" members opposed to the transfer were defeated year by year, and young townsmen agreeable to the transfer were appointed. But, peculiarly enough, just when the last of the old members was to be "shunted," and the requisite unanimous signature seemed in view, several of the new members became more conservative in their views on the question than the "old hereditaments." They required a strict agreement, before any transfer, that the price of gas should never be more than a certain figure according to the cost of coal, and that a sum of money should be spent on Dalton Proper as a *quid pro quo*. Then the Askam, Newton, and Lindal members objected to the erection of a library or anything of the kind in Dalton, unless their parts of the district were similarly blessed. And so the struggle went on to the present time, when it has assumed a new aspect; the fight raging in the Committee, instead of outside it as of yore. Nearly half the present Committee are members of the Urban Council; one being the Chairman of the Council, Mr. Ashburner.

The price of gas has been reduced so low, and the old loan paid off so rapidly, that the Committee are now without a reserve fund, and new holder accommodation is imperatively necessary. Taking advantage of this position, some members are for turning the works over to the Urban Council rather than incurring debt; and others would prefer to lend the money required themselves. There have been several stormy meetings; but at the last Mr. Ashburner proposed that all the members should retire at the annual meeting in April, and so allow the public to elect a Committee to their liking *en bloc*. This was hotly opposed by two members; but seeing themselves outdone by their opponents, they left the room, and the resolution was carried by the remaining four. The upshot will be seen at the next meeting (on the 25th inst.), and is awaited with great interest.

PUSHING BUSINESS AT DARLINGTON.

The Gas Committee of the Darlington Corporation possess, in their Engineer and Manager (Mr. Frank P. Tarratt), a man who is thoroughl impressed with the importance of keeping the advantages of gas as an illuminating and heating agent well before the section of the general public with which he is immediately concerned; and he is quite alive to the value of the gas exhibition, combined with cookery lectures, as the means by which this desirable end can be best attained. During the past month he held three exhibitions, each of which remained open for about six days, in different parts of the borough. He did not confine himself to a simple announcement of the exhibition by placards, open the doors, and wait for his audience, but secured the co-operation of the Richmond Gas Stove and Meter Company, Limited (who supplied the stoves), whose representatives systematically canvassed the consumers in the district. The result was that orders were taken for 134 cookers of various sizes for ordinary hire, and 1450 to be fixed free for use with prepayment meters. Considering that these were, with very few exceptions, new orders, and not exchanges, the figures, for a town of the size of Darlington, constitute a record. At two of the exhibitions (those held at the Assembly Hall and the Corn Exchange), the lighting was done by the Keith high-pressure incandescent system, and there was a display of gas-fittings and incandescent burners generally, with a small exhibit of gas appliances and tar products shown by the Gas Department, which proved an additional attraction. Mr. Tarratt has been very successful with the prepayment meter business. His first meter was fixed on March 8, 1898, and by the end of the year he had put in 66; this number being increased successively to 427, 1065, and 1980 at the close of the succeeding three years, and to 2086 by last month. The average consumption of gas through these meters in the past year was 8956 cubic feet—the lowest being 1700, and the highest 36,000 cubic feet. Each inspector visited, on an average, 54 meters per day, the average amount in each being 5s. 6d., and the sum collected per day £15. No wonder the gas business is flourishing at Darlington, as shown by the fact that the Committee are able to hand over 10d. in the pound to relieve the rates from the profits of the year.

GAS CONSUMPTION IN BERLIN.

Large Increase.

The following figures relating to the increase in the consumption of gas from the municipal gas undertaking of Berlin will be of interest: In 1900, the maximum output in a day occurred on the 31st of December, when 24,150,000 cubic feet of gas were consumed. The day of maximum output last year, however, was the 21st of December, when no less than 28,375,000 cubic feet were burnt—that is to say, 4,225,000 cubic feet more than on the day of maximum consumption in the previous year. This corresponds to an increase of 17·7 per cent., which is more than double the normal advance in consumption. Special measures had to be adopted by the officials to meet this unexpected increase. The management cannot foretell with certainty when the day of maximum consumption is likely to occur. Very often it falls within the so-called maximum week, as was the case last year. During this week (Dec. 17 to 23), 183,220,000 cubic feet of gas were sent out from the municipal works; the highest week's supply in the preceding year being 159,720,000 cubic feet. This increase is at the rate of 14·5 per cent. Last year the maximum day's consumption of the preceding year was exceeded 16 times, and the maximum week's output of the preceding year was reached as many as 26 times last year. It will thus be seen that the management have forthwith to take steps to meet this extraordinary growth in the demand for gas in Berlin.

The St. Helens Water Committee have accepted the tender of Mr. C. W. Davenport, of Warrington, for the construction of the new reservoir at Brown Edge. The cost is £24,980; and the reservoir is to have a capacity of 10 million gallons.

GAS SUFFOCATION CASE IN DUBLIN.

A Family of Three Killed.

On Monday evening of last week, a terrible fatality was brought to light at No. 115, Rialto Cottages, near Dolphin's Barn, Dublin, which was occupied by a fitter, named Augustine O'Neill, and his wife and child. The family had not been seen since the previous Saturday; and the suspicions of the neighbours being aroused, the police were communicated with. On the bursting open of the door of the house, there was a rush of gas into the street, which for a quarter-of-an-hour prevented anyone from entering the place. At the end of this time, a man living near pluckily dashed in and turned off the gas from the main; and an investigation then became possible. O'Neill, clad only in his shirt, was found lying on his back on the floor near the range, quite dead; while Mrs. O'Neill and the child (aged five years) were discovered dead on the bed. An examination of the kitchen quickly revealed the cause of the sad occurrence; for it was found that the meter had been removed from its place, and that the service-pipe and the pipe supplying the fittings had been connected by means of india-rubber tubing, so as to allow the gas to enter the premises without being registered. It was surmised that the family retired to bed on Saturday night without turning off the gas at the main, and that when the lights in the neighbourhood were extinguished, the pressure of gas displaced the tubing, and thus permitted the gas to escape into the room. At the inquest which was subsequently held on the bodies, Mr. W. J. Sugg, an Engineer in the service of the Gas Company, stated that the fittings had been tampered with, and that the effect of this was that the gas was obtained without payment. Dr. Earl deposed that, by direction of the Coroner, he made a post-mortem examination of Mrs. O'Neill. The body presented post-mortem staining of a peculiar pink colour on the back; and the greater portion of the body had a pink tinge. The blood was of a bright red colour; and all the organs showed more or less markedly a bright red to reddish pink tinge. The blood smelt of gas. With all the tests that were applied, a bright red colour was obtained, which indicated the presence of carbon monoxide gas in combination with the colouring matter of the blood. He was of opinion that death was caused by carbon monoxide poisoning. Mr. Byrne, on behalf of the Gas Company, asked the Jury to say that his clients were in no way responsible for the occurrence. It was plain that what the unfortunate man did was to disconnect the meter. The Coroner: On the evidence, we have no proof whatever as to who did this. Mr. Byrne said he merely wanted to show the Jury that, whoever tampered with the fittings, it was not done by the Gas Company's servants. The Coroner, addressing the Jury, said that undoubtedly the fittings were not as they should be. Their duty there was to discover the cause of death. Having found that, the Jury had the privilege of saying whether they consider that blame attached to anyone. The Jury found that the deceased died from carbon monoxide poisoning, which escaped from the service-pipe owing to its being disconnected from the meter.

HOUSE LIGHTING BY HIGH-PRESSURE GAS.

The Hotel Minerva, Cologne, is a new establishment of first-class order and style. One of its features is the lighting, which is accomplished by electric incandescent lights and high-pressure gas, which gives the spacious suite of rooms on the ground floor a magnificent and almost fairy-like appearance. The gas lighting adopted is Keith's high-pressure system; and it has been fitted up, under the supervision of Herr A. Frolich, by the Blackman Export Company, of London, and 11, Glockengasse, Cologne—the Continental house of the James Keith and Blackman Company, Limited, of London. The installation does infinite credit to all concerned.

It is believed that the Hotel Minerva installation is the first on the Keith system in any hotel in Germany; and those who have seen the lighting say that, judging from the effect produced, the system ought before very long to become as popular in Germany as it is in the United Kingdom, and almost universal in its application to similar hotels, cafés, and places where effective, brilliant, and pleasant artificial illumination is a desideratum. A No. 3 Keith automatic gas-compressor—worked by the excellent city water service of Cologne—is fixed in the basement, and supplies about 60 Keith high-pressure burners throughout the hotel, which (unless for mere experiment with the electric light) wholly and solely light the large rooms of the hotel. On each of the chandeliers there are three high-pressure burners and mantles above, and six incandescent electric light lamps beneath. Should both the gas and electric light be turned on at once, each set respectively costs about the same amount per hour; but the gas emits from ten to twelve times the illumination of the electric light. The effect is most peculiar; the electric lights appearing in comparison to be quite red in tone, and almost blotted out, while the gas-lights look more like artificial daylight, with an attractive sort of halo round each light. The high-pressure gas lighting at the hotel is most popular; the peculiarly soft but brilliant quality of the light and its steadiness surpassing anything of the kind in gaslight ever seen in Cologne before. The grounds of the Turin Exhibition this year are also to be lighted by the Keith high pressure system.

SHANGHAI GAS COMPANY, LIMITED.

Annual Report.

The report presented at the recent annual general meeting of the above-named Company—the first as a limited liability undertaking, and the 38th since its origin—opens with the gratifying statement that during the twelve months the business continued to show satisfactory progress; the profits on the working account amounting to 91,813·85 taels, the revenue having been 252,966·99 taels, and the expenditure 161,153·14 taels. After providing for interest on debentures, bad and doubtful debts, and writing off 1647·53 taels for expenses incurred in the

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 952.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	Apl. 11	10½	Alliance & Dublin 10 p.c.	18—19*	+⅛	5 10 6
100,000	10	,,	7½	Do. 7 p.c.	13—14*	+⅛	5 7 2
300,000	100	Jan. 2	5	Australian 5 p.c. Deb.	100—102	..	4 18 0
200,000	5	Nov. 13	6⅓	Bombay, Ltd.	6¼—6⅜	..	4 16 4
40,000	5	,,	6⅓	Do. New, £4 paid	4¼—4⅜	..	5 9 5
380,000	Stk.	Feb. 13	12	Brentford Consolidated	257—262	−3	4 11 7
270,000	,,	,,	9	Do. New	188—193	..	4 13 3
50,000	,,	,,	5	Do. 5 p.c. Pref.	128—133	..	3 15 2
206,250	,,	Dec. 13	4	Do. 4 p.c. Deb.	112—115	..	3 9 7
220,000	Stk.	Mar. 13	10	Brighton & Hove Orig.	202—207	..	4 16 7
246,320	,,	,,	7	Do. A. Ord. Stk.	147—152	..	4 12 1
420,000	20	Apl. 11	10	British	40—41*	..	4 17 7
50,000	10	Feb. 13	12	Bromley, Ord. 10 p.c.	23—25	..	4 16 0
82,850	10	,,	9	Do. 7 p.c.	18—20	..	4 10 0
500,000	10	Oct. 11	6	Buenos Ayres (New) Ltd.	10—11	..	5 9 1
220,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb.	94—97	..	4 2 6
150,000	20	Mar. 13	8⅓	Cagliari, Ltd.	21—23	..	7 3 6
100,000	10	Sept. 27	10	Cape Town & Dis., Ltd.	15—16	..	6 5 0
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	54—56	..	5 7 2
550,000	Stk.	Apl. 11	12	Commercial Old Stock	263—268*	+1	4 9 7
236,425	,,	,,	9	Do. New do.	203—208*	+2½	4 6 7
238,237	,,	Dec. 13	4½	Do. 4½ p.c. Deb.	130—135	..	3 6 8
800,000	Stk.	,,	9	Continental Union, Ltd.	155—160	−5	5 12 6
200,000	,,	,,	7	Do. 7 p.c. Pref.	157—162	−3	4 6 5
575,000	Stk.	Feb. 27	5	Crystal Palace Ord. 5 p.c.	120—125	..	4 0 0
60,000	,,	,,	5	Do. 5 p.c. Pref.	122—127	..	3 18 9
486,090	10	Jan. 30	10½	European, Ltd.	18½—19½	..	5 7 8
354,060	10	,,	10½	Do. £7 10s. paid	13½—14½	..	5 8 8
15,243,200	Stk.	Feb. 13	4 16/16	Gas-light and Coke	4 p.c. Ord.	91—93	.. 4 14 7
2,600,000	,,	,,	3½		3½ p.c. max.	89—91	.. 3 16 11
3,799,735	,,	,,	4		4 p.c. Con. Pref.	108—111	−1 3 12 1
4,193,975	,,	Dec. 13	3		3 p.c. Con. Deb.	90—92	−1 3 5 3
70,000	10	Nov. 13	8	Hongkong & China, Ltd.	13—14	..	5 14 4
3,800,000	Stk.	Nov. 13	10	Imperial Continental	210—214	+1½	4 13 6
473,600	Stk.	Feb. 13	3½	Do. 3½ p.c. Deb. Red.	100—102	..	3 8 8
561,000	Stk.	Feb. 27	10	Liverpool United A	221—224	−1	4 9 3
718,100	,,	,,	7	Do. do. B	168—170	..	4 2 4
306,083	,,	Dec. 30	4	Do. do. Deb. Stk.	118—120	..	3 6 8
75,000	5	Dec. 13	4	Malta & Medn., Ltd.	4¼—5	..	4 0 0
560,000	100	Apl. 1	5	Met. of 5 p.c. Deb.	105—109*	..	4 11 9
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	101—103*	..	4 7 5
541,920	20	Nov. 13	3½	Monte Video, Ltd.	9½—10⅝	+⅛	6 13 4
1,595,892	Stk.	Feb. 21	4⅝	Newc'tle & G'tesh'd Con.	107—108	+½	4 1 0
346,855	Stk.	Dec. 27	3½	Do. 3½ p.c. Deb.	98—100	..	3 10 0
150,000	5	Nov. 28	8	Oriental, Ltd.	7⅛—8	..	5 0 0
135,000	4½	,,	8	Do.	6¾—7¼	..	4 19 4
15,000	1	,,	8	Do.	1⅛—1⅜	..	4 11 5
60,000	5	Mar. 13	7	Ottoman, Ltd.	6—6⅛	..	5 7 8

* Ex. div.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
851,070	10	Oct. 11	7	River Plate Ord.	10⅛—11	..	6 7 3
250,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb.	95—98	..	4 1 8
250,000	10	Mar. 26	8	San Paulo, Ltd.	11⅛—12⅛*	..	6 8 0
135,000	Stk.	Mar. 13	10	Sheffield A	239—241	..	4 3 0
209,984	,,	,,	10	Do. B	238—240	..	4 3 4
523,498	,,	,,	10	Do. C	237—239	..	4 3 8
5,850,000	Stk.	Feb. 13	5	South Met., 4 p.c. Ord.	121—123	+1½	4 1 4
1,627,965	,,	Jan. 16	3	Do. 3 p.c. Deb.	92—94	..	3 3 10
380,940	Stk.	Nov. 13	5	Southampton Ord.	104—108	..	4 12 7
70,825	,,	Jan. 16	4	Do. 4 p.c. Deb.	100—102	..	3 17 8
120,000	Stk.	Feb. 27	5½	Tottenham and Edmonton A. 5 p.c. B. 3½ p.c.	120—125	..	4 8 0
260,520	,,	,,	4		93—98	..	4 1 8
182,380	10	Jan. 16	5	Tuscan, Ltd.	7—8	..	6 5 0
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	97—100	..	5 0 0
230,000	5	Mar. 13	9	West Ham, 10 p.c.	9—10	..	4 10 0
172,000	10	,,	6	Do. 7 p.c.	12½—13½	..	4 8 11
140,900	Stk.	Dec. 30	4	Do. 4 p.c. Deb.	105—110	..	3 12 9
				WATER COMPANIES.			
780,599	Stk.	Dec. 30	11⅛	Chelsea, Ord.	310—320	..	3 11 11
150,000	,,	,,	5	Do. 5 p.c. Pref.	155—160	..	3 2 6
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75	140—145	..	3 2 1
175,785	,,	Mar. 26	4½	Do. 4½ p.c. Deb.	140—145*	..	3 2 1
1,720,560	Stk.	Mar. 26	8	East London, Ord.	203—205*	..	3 16 11
654,740	,,	Dec. 13	4½	Do. 4½ p.c. Deb.	143—148	..	3 0 10
1,018,046	,,	,,	3	Do. 3 p.c. Deb.	96—98	..	3 1 3
700,000	50	Dec. 13	8	Grand Junction 10 p.c. max.	115—120	..	3 6 8
310,000	Stk.	Mar. 26	4	4 p.c. Deb.	127—130*	..	3 1 7
708,000	Stk.	Feb. 13	16	Kent	300—310	..	5 3 3
160,000	,,	,,	7	Do. New, 7 p.c. max.	200—210	..	3 6 8
1,043,800	100	Dec. 30	10½	Lambeth, 10 p.c. max.	295—300	..	3 10 0
406,200	100	,,	8	Do. 7½ p.c. max.	210—220	..	3 12 9
350,000	Stk.	Mar. 26	4	Do. 4 p.c. Deb.	125—130*	..	3 1 7
500,000	100	Feb. 13	12⅛	New River, New Shares	403—415	..	3 1 8
1,000,000	Stk.	Jan. 30	4	Do. 4 p.c. Deb.	127—130	..	3 1 7
902,300	Stk.	Dec. 13	7	South-wark and Vauxhall Ord. 7½ p.c. max. 5 p.c. Pref. 4 p.c. A Deb.	195—205	..	3 8 4
126,500	100	,,	7		185—195	..	3 11 10
489,200	Stk.	,,	5		155—160	..	3 2 6
1,019,585	,,	Apl. 11	4		125—130*	+2	3 1 7
1,155,066	Stk.	Dec. 13	10	West Middlesex.	290—300	..	3 6 8
200,000	,,	,,	4½	Do. 4½ p.c. Deb.	140—145	..	3 2 1
200,000	,,	Mar. 13	3	Do. 3 p.c. Deb.	95—97	..	3 1 10

* Ex. div.

formation of the new Company, the net profit was 82,716·47 taels. The balance at the credit of profit and loss account, after deducting the amount of the interim dividend, at the rate of 6 per cent., paid in July, and crediting the account with the balance of 3736·67 taels taken over from the old Company, was 62,453·14 taels, which the Directors recommended should be appropriated as follows: Final dividend of 6 per cent. on the capital, 24,000 taels; depreciation of land and buildings, distributing plant, and furniture, 17,212·62 taels; renewals and depreciation account, 15,000 taels—leaving to be carried forward 6240·52 taels. The private consumption increased by 20,196,940 cubic feet, or 15·24 per cent., and the public lighting by 474,320 cubic feet, or 5·81 per cent. At the end of the year, there were 28 gas-engines in use, against 22 in 1900. There were 1561 tons more coal carbonized than in 1900, and 21,219,020 cubic feet more gas produced. The residual products showed a considerable increase. The fittings department was kept fully occupied throughout the year. The Company's Engineer (Mr. H. King Hiller) reported that the experimental regenerative setting mentioned in his previous report had been completed and set to work, with satisfactory results. Further new plant necessary for the increasing business of the Company had been ordered, and would be installed during the current year. The whole of the works and plant had been maintained in good condition. The quantity of coal, &c., carbonized was 16,419 tons 10 cwt.; of gas manufactured, 173,001,320 cubic feet—the yield per ton being 10,536 cubic feet, of an average illuminating power of 18 candles. The gas sold during the year and remaining in the holders on Dec. 31, was 161,807,393 cubic feet.

ANCIENT REGULATIONS FOR GAS CONSUMPTION.

It may be remembered that at the recent annual meeting of the Newcastle and Gateshead Gas Company (*ante*, p. 491), Sir W. H. Stephenson, the Chairman, gave some interesting particulars in regard to the conditions under which gas was supplied in the city prior to the introduction of meters. By a rather strange coincidence, the regulations issued by the Airdrie Gas Company between 1830 and 1835 have just come to hand; and we give them as presenting a view of the early days of gas lighting in North Britain. The charges were annual for from 1 to 16 jets from sunset to 8, 9, 10, 11, and 12 p.m., and from 4, 5, 6, and 7 a.m. till sunrise. The charge for one jet till 12 p.m., was 15s., and from 4 a.m., 7s. For 16 jets the charges for the same period were £9 14s., and 10s. 6d. respectively. One-sixth was to be added when the lights were used on Sundays. Weavers were charged 7s. for each jet, and had liberty to burn when they chose from sunset till 11 p.m.; but if any were found allowing gas to burn when they were not at work, they were charged double. Weavers were to have light from Sept. 1 till April 1. The charge for gas by meter was 8s. per 1000 cubic feet. The regulations were as follows:—

1.—Lighting shall not commence till sunset.

2.—The jet flames shall not exceed 3½ inches in height; No. 1 argands not to exceed 1¾ inches; No. 2, 2 inches; No. 3, 2¼ inches. When the flames are allowed to rise above these heights, a considerable waste is occasioned by the gas escaping unconsumed, and is not only productive of smoke, but is offensive and injurious. In no case, however, shall argands be used without cylindrical glasses

3.—All contracts with the Company to be held as for one year—viz., from Whitsunday to Whitsunday; at which time the Manager will take an account of the number of burners each consumer of gas will require for the ensuing year, and will deliver to him or her a copy of these conditions and regulations. Persons commencing between the above periods to be charged from the time their premises are lighted, up till the Whitsunday following. No lights will be changed but at Whitsunday, after giving notice to the Manager.

4.—The lights must be extinguished within a quarter-of-an-hour of the time contracted for, under the penalty of 5s., except on Saturdays, when they may be used till 12 o'clock.

5.—Before the gas is supplied, the Manager must be satisfied that the interior fittings are correctly made, and one day's notice is required when fittings are to be examined. In case of getting into disrepair, so as to occasion an escape of gas, the supply will be discontinued until put into proper order. The Manager to have access at all seasonable hours to check the height of flame and examine the burners.

6.—No burners or meters shall on any account be used but those furnished by the Company, and paid for on delivery.

7.—Should the apertures or holes of the burners be widened, from use or otherwise, the Manager is authorized to take them away, and turn off the gas, until replaced by new ones; but if any person be detected wilfully enlarging them, the Company will discontinue the supply altogether, and the charge paid in advance will be forfeited to the Company.

8.—The charges to be paid in advance—one-half on the 1st of October, the other half on the 1st of January, at which times the Manager will call; and if the said charges are not paid within one month after the first call, he is authorized to take legal steps to recover it. No partial payments will be accepted.

9.—None to be allowed light in the morning without a particular agreement, and paying for such light over and above their evening light. Public-houses to be charged till 11 o'clock.

10.—If any are detected using lights within their premises which they have not contracted for, they shall be charged for the whole year for the said light; or, if found using the lights which they have contracted for, through the night, or by day, or on the Sabbath, or at any time beyond the time stipulated for, they shall incur a penalty or fine of 10s. 6d., and the gas be discontinued.

11.—The Directors are determined to carry the above regulations into effect, and agree to furnish the consumers with a copy, that none may plead ignorance.

*** When a smell, indicating an escape of gas, is anywhere perceived, it is earnestly requested that notice be given at the Company's office; and special care must be taken to avoid coming near the place with light of any kind, especially in cellars or other confined places, so as to prevent accidents.

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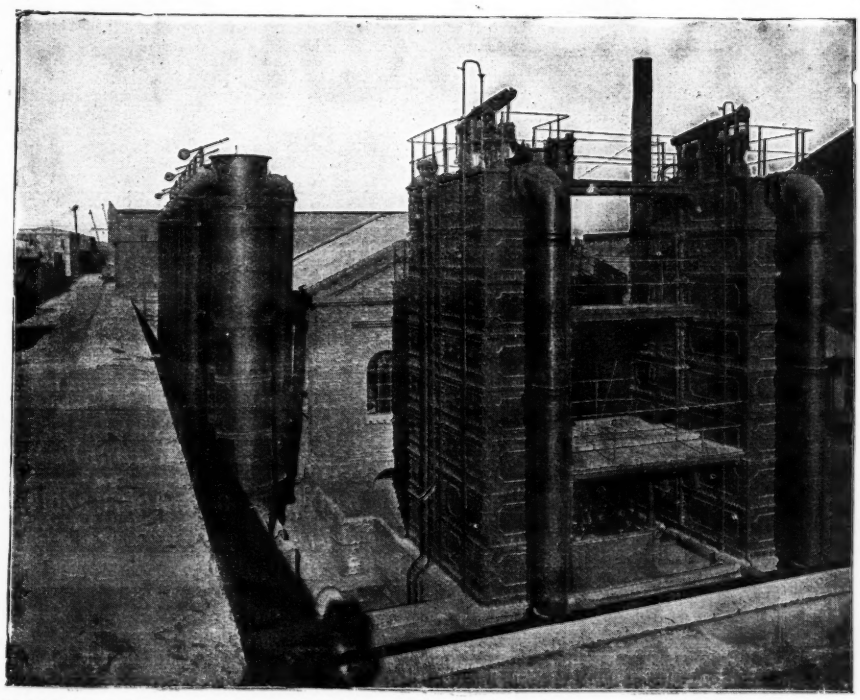

THE ANNULAR CONDENSER FITTED WITH WATER COOLING ARRANGEMENT COOLS DOWN THE GAS TO THE WATER TEMPERATURE IN THIS HOT CLIMATE.

WALKER'S PATENT CONDENSER AND PURIFYING-MACHINE AT SANTIAGO GAS-WORKS.

GAS v. ELECTRIC LIGHTING IN BRISTOL.

Arc Lighting to be Extended.

At the Meeting of the Bristol Town Council last Tuesday, a report was presented from the Sanitary Committee containing the recommendation already referred to in our "Electric Lighting Notes" (*ante*, p. 909), that the electric lighting of the city be extended by the addition of 366 arc lamps, at an estimated cost of £2783 per annum. A copy of the following letter, which had been circulated by the Secretary of the Gas Company (Mr. John Phillips), had been received by the Committee.

In view of the Council meeting on Tuesday next, when the report of the Sanitary Authority *re* extension of electric lighting will be presented, allow me to draw attention to the relative cost of the schemes for incandescent lighting and electric extension.

At the present time, there are in the borough 7966 gas-lamps with single flat flames of 16-candle power each, and 204 larger lamps, mostly fitted with clusters of flat flames, varying from 30 to 80 candle power. In March of last year, negotiations were opened between the Sanitary Authority and the Company with reference to incandescent lighting for the public lamps; and eventually it was agreed that the single flat-flame burners should be replaced by No. 4 Kern burners of 100-candle power, and that we should supply gas, renew mantles, light, clean, and repair the lamps, for the sum (at the present price of gas) of £2 12s. 6d. per lamp per annum—a reduction of 6s. each on the present charge, representing a saving of £2390 per annum.

Provided this arrangement were carried out, the large lamps might be fitted with double Kern burners of 200-candle power at a reduction of £580 per annum. Burners of 16-candle power would be replaced by 100-candle burners, and clusters giving 30 to 80 candles by those giving 200 candles, and a total saving to the city effected of £2970 per annum.

My Board, after due consideration, decided, as a matter of business policy, to make this concession; but it must be distinctly understood that they have not, and never had, any intention of offering these terms for only such portion of the lighting as it might please the Authority to determine. We are prepared to carry out in its entirety the agreement entered into with the Authority, and confirmed by the Council on the 11th of February, but which the Authority is now seeking to upset.

In the report to be submitted to the Council, it is suggested that 527 gas-lamps shall be discontinued. With the information available, I find that these lamps cost for the past year £1565. This is less than the amount given in the report; but I have only accounted for lamps actually in use, not for the problematical 28 which it is stated are needed in Clifton and St. George.

The extra cost of electricity works out as follows:—

365 arc lamps at £14 10s.		£5307
Less reduction of £2 on 310 existing lamps	£620	
Cost of 527 gas-lamps	£1565	
		£2185
Extra cost		£3122

I presume the £14 10s. per lamp does not include the cost of the standard, which will be charged to capital. The case stands thus:—

By adopting the incandescent lighting scheme, there is an actual saving of	£2970
By adopting the electric extension scheme, there is an extra cost of	£3122

So that the adoption of the latter scheme will mean that the city will be out of pocket to the extent of £6092 per annum, in addition to which the streets not included in the scheme will lose the benefit of improved lighting. The last extension cost £4072 per annum over gas lighting. This, with the proposed expenditure, will make a goodly sum, equal to about 1¾d. in the pound on the rates.

The advertised candle power of the electric lamps is nominal. Their actual light-giving power is about half the nominal; and I understand that the new lamps proposed to be erected will be only half the power of the old ones. At present every alternate electric lamp is extinguished at midnight.

We are prepared to supply high-pressure incandescent gas-lamps, giving superior light to the electric arc lamps, at half the price of the latter. The whole question is for the ratepayers. They have to pay the bill, and should know the cost.

The Chairman of the Committee (Alderman Cope-Proctor) moved that they be empowered to carry out an extension of the electric lighting. In doing so, he asked the Council to deal at once with the question of principle—extension or no extension of the arc lighting. When the agreement was made with the Gas Company, there was no understanding as to the electric lighting. Were they to be put into the position of saying: "The electric light is good enough to manufacture and sell to others, but too expensive for us to use?" He objected to the suggestion of a threat in the letter of the Company, and expressed the hope that they would be able to work amicably together. If, however, the Committee were forced to put up the gas-fittings themselves, they could do it effectively, though probably not with such ease and expedition as the Company. As to the nominal and actual candle power of the electric light, he would quite as soon trust them to be accurately represented as the gas-lamps. Mr. Lloyd seconded the motion. In the course of the discussion which followed, Alderman Davies confessed to having qualms about the proposed expenditure while there was such bad housing in Bedminster. Mr. Collins advocated incandescent gas lighting. Mr. Levy thought the Committee's scheme of lighting the highways and byways was too extravagant. There was a great element of the Electrical Committee in the Sanitary Committee to be fought. He had seen the Lucas light, and he wanted to witness an experiment with it in Bristol, or with any other light, so long as it was cheaper and better. He moved, as an amendment, that the report be deferred for an experiment with the Lucas lamp. Mr. Holman seconded the amendment, saying that the discussion was a demonstration of the dangers of municipal trading. One speaker went in for competition, and another said they should support the electric light at all cost. They were there in the interests of the ratepayers, and should as carefully consider the offer of the Gas Company as if it were made to them in their private capacity. Mr. Smith uttered a word of warning against adding a halfpenny here and a halfpenny there to the rating, in view of the dock extension scheme. He supported the amendment. Mr. Levy-Langfield argued against rejecting a good thing merely because it came from the Gas Company. Alderman Pearson, Chairman of the Electrical Committee, thought it was perfectly understood that the scheme of improved lighting was to be both by electricity and gas. Mr. Tryon, who is a member of the

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Committee, spoke strongly against spending money on luxuries, in view of the present liabilities of the ratepayers and the prospects of the immediate future. On being put, the amendment was rejected by a large majority. The resolution was adopted; but the application of the principle to streets was postponed.

OIL v. GAS FOR PUBLIC LIGHTING.

Gas Triumphant at Downham.

About four years ago, the Downham Market Urban District Council, disagreeing with the charges made by the Gas Company for street lighting, determined to dispense with the gas-lamps, and adopt petroleum for the purpose of illuminating the town at night. The experiment has been the means of raising considerable opposition to a continuance of its use; and the Council have lately been in negotiation with the Company to ascertain on what terms a re-installation of the gas-lamps could be obtained. The question came before the Council at their last monthly meeting. A Special Committee who had met representatives of the Gas Company to consider the matter, recommended the Council to accept the Company's offer to light the town with incandescent burners at £2 3s. 6d. per lamp for the usual period of lighting, the contract to be for five years. They had put up an experimental lamp, and agreed to re-arrange the lamps, where necessary, to the number of twelve, and also to erect standards and fix brackets for any additional lamps, and connect them with the mains; these additional lamps to be on or near the spot occupied by the existing oil-lamps. The Company were willing to purchase from the Council, at market prices, any standards or brackets, &c., at present in use for the oil-lamps which they might require. Mr. C. Hawkins, who presided, said the whole question was one which should be very carefully discussed; and he advised the Council to make the best terms they could with the Gas Company for one year. The town needed better arrangements for its public lighting, and the incandescent light was the best at their disposal. Mr. T. H. Wenn said he would accept his share of the responsibility for the introduction of the oil-lamps, with which at first everyone was satisfied. (Cries of "Question.") He should like to know whether there was anything the matter with the oil, as he had heard that lately it was not so good as it should have been. He moved—"That the quality of the oil at present in use be tested, to see if the Council were getting petroleum of the standard they had contracted for." Mr. A. Bird seconded the motion. Mr. Sly moved, as an amendment, that the recommendation of the Committee be adopted, and Mr. Andrews seconded the proposition. As a further amendment, Mr. Harvey moved that the matter be referred back to the Committee. He objected to entering into a five years' contract when the members of the Council were only elected for three years. He also thought that the terms offered by the Gas Company were unreasonable and unjust to the ratepayers. Mr. Moore seconded Mr. Harvey's amendment. Amid continual interruption, Mr. Wenn again spoke in support of his resolution. He said he had gone into the figures, and found that the Company should charge them at no more than 29s. 4d. per lamp; and yet there were members of the Council who posed as ratepayers' friends advocating that they should pay £2 3s. 6d. per lamp. It seemed as if they were working in the interests of the Company, and not of the ratepayers. The oil-lamps had saved the ratepayers £50 per year. (A voice: "And kept the town in darkness.") He was not against lighting the town with gas; but he would never advocate that the Company should be paid £2 3s. 6d. per lamp when 29s. 4d. was a reasonable amount. Mr. Vallance said the town was entirely disgusted with the oil-lamps. Gas was the best light they had at hand; and as the Gas Company had made a good offer, as they had come down from 55s. to 43s. 6d. per lamp, the Council should take advantage of the offer. On being put to the vote, Mr. Wenn's original motion was lost. He then moved that the offer of the Gas Company, not being a reasonable one, be not considered for the present, on account of the extravagant price asked, and that the matter stand over until the Company were prepared to offer better terms and agree to take over the plant belonging to the town. Mr. Bird seconded this proposal; but it was rejected. Mr. Harvey's amendment was also defeated. Mr. Sly's resolution to adopt the report of the Committee was then brought forward, which led to further discussion for and against the re-introduction of gas. Those in favour of it urged that since the town had been lighted by oil, trade had suffered and the population had decreased; while the other side declared that such a step should not be taken until better terms could be obtained from the Gas Company. Eventually, the Committee's recommendation was adopted by 17 votes to 12.

ELECTRIC LIGHTING NOTES.

Dangers of Electric Shocks.

Our readers may remember that some weeks ago a man named Hind died at the Attercliffe Theatre, Sheffield, after a shock caused by an electric current conveyed to him by means of a disused bracket which he had incautiously clasped. At the meeting of the Sheffield City Council last Wednesday, Alderman Styring referred to the matter. After recapitulating the facts of the case, he said the current was supplied to the theatre at a pressure of 200 volts, with a periodicity of 50; but that whatever was the cause of death, it was not an electric shock. There was no room for controversy as to the danger of current at 200 volts pressure. The Board of Trade allowed as much as 250 volts to be used. The attention of the Board's Electrical Adviser had been called to the case, and he wrote: "I have learned nothing that would lead me to advise the Board of Trade that the existing regulations which permit a supply at 250 volts (alternating) to a consumer's premises, should be altered, as I have no reason to believe that ordinary shocks at that pressure are dangerous." Alderman Styring added that in the course of their duties, the officials of the Electric Supply

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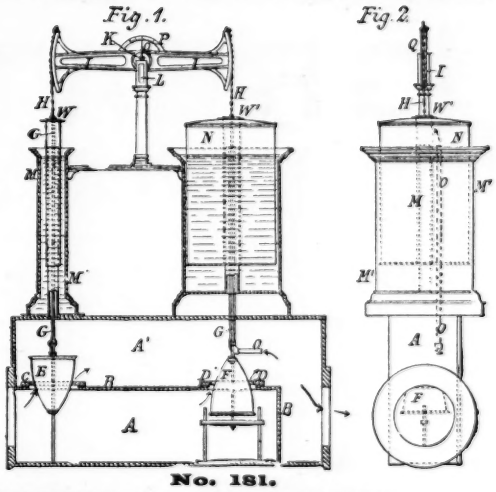

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Department not at all infrequently received shocks at 200 volts, and they had, in fact, had them at 2000 volts, without serious consequences. A member of the Institution of Electrical Engineers gave it as his opinion that at anything below 600 volts the conditions must be abnormally favourable to cause death.

"Grand" Electric Lighting at Barnsley.

The Chairman of the Electricity Committee of the Barnsley Corporation gave the Council, at their meeting last Tuesday, some particulars in regard to the working of the undertaking in the year just completed. He said the trading profit was £2543, or an increase of £292 on the previous year; and that after bringing forward a balance of £8, and allowing £2397 for interest and the repayment of loans, there remained £154 of net profit to be carried forward. In view of these results, the Committee had unanimously agreed to reduce the flat rate of 4½d. per unit to one of 4d. This meant a concession of £217; but they hoped to recoup this by an additional output. He moved the confirmation of the minutes containing the resolution on this subject. Alderman Wray, in seconding the motion, said he was sure the Council would be pleased and gratified at such excellent results, which should satisfy the gentlemen who opposed this grand electric light scheme simply on one ground—viz., that it would be such an additional burden on the rates. After this pleasant speech, it was disappointing to hear dissatisfaction expressed. Mr. Carter asked if the Committee had done anything to regulate the lamps in Shambles Street, where there were a lot of complaints. Mr. Brady (the Chairman) said that the fittings were now all ready, and would probably be in position within about ten days. The minutes were then passed.

The rather strong adjective with which Alderman Wray qualified the electric lighting does not appear, from some remarks in the "Barnsley Chronicle," to have been quite justified. Referring to the proceedings at the Council meeting, our contemporary last Saturday said: "The Chairman of the Electric Light Committee gave a brief and highly encouraging report upon the adoption of the light for various purposes, and announced a reduction in price; but not one word was said about the wretched street lighting the ratepayers have patiently endured for weeks past. It is not too much to say that our town has never been in a worse plight than it is at present in this respect. Its condition is not a credit to the Committee or anybody concerned; and if it cannot be improved after the costly outlay for electricity in its most modern developments, it would be better to return to gas lighting, which, with the aid of incandescent improvements, would be infinitely better than any results we have seen in Barnsley from the electric light in our streets. The excellent incandescent lighting at Cudworth Station is a fair example of what can be done at no very great expense. This could easily be adopted in those streets in Barnsley not served with electricity." It is scarcely necessary to add that the station referred to is lighted by the Barnsley Gas Company.

Electric Light Finances at Hastings.

At the meeting of the Hastings Town Council on the 4th inst., the accounts of the Electricity Department were presented. They showed that the income amounted to £14,961 16s. 10d. for the year ending Dec. 31 last. A gross profit of £5601 2s. 3d. was made, which was transferred to the net revenue account, and after interest and bad debts had been accounted for there was a deficit. Dr. Allfrey moved the adoption of the accounts, and in doing so said the Council must not think they were going from bad to worse. In the past year the loss was £1900, whereas in the previous year it was £1700; but the case was not really so bad as it appeared. The item of management had gone up from £701 to a total of £1305. Anyone reading this might certainly think that it was not management but mismanagement; but it was not so. He went on to explain the reasons for the difference, which was due to the regulations of the Local Government Board. Though they had an increase of 1s. a ton in coal, it was satisfactory to find that, although during the year they had generated 180,000 more units, the cost was £100 less. The machinery was a good sinking fund. At the same time, it was hard to admit that there was a deficiency which had to be made up by the ratepayers; but the regulations of the Local Government Board were such that they had had to pay in three years £9000 on their earnings before making a profit. Mr. Bones seconded the motion, and said things were not so dark as they looked, and he hoped next year they would be better. Mr. Chesterfield moved that the matter be adjourned for a month, as a protest against supplementary papers. The members had not had time to consider this subject since the previous evening. Mr. Shoesmith seconded this proposition, and it was carried.

Commenting on the proceedings reported above, the "Hastings Weekly Mail" says: "It is not surprising that the Council accepted a motion to defer till the next meeting the consideration of the accounts of the electric light works for the year ended the 31st of December last. These intricate accounts were issued as late as Thursday afternoon [the 4th inst.]. Although the members of the Council did not feel justified in entering upon a discussion at so short a notice, Dr. Allfrey, the Chairman of the Committee, said enough to show that the undertaking has yet to be made a financial success. The explanation he gave for an increased loss is that, owing to the demands of the Local Government Board, the expenses have increased by £600. To begin with, the department failed to meet all charges last year, by £1949 14s. 11d.; the previous year, the loss was £1741. Thus, despite a much greater business due to a larger area of operations, the loss was increased. The Committee may well be asked whether it is not evident that the charge for current to private consumers on the new system does not pay. The public electric lighting is charged at £3696 11s. 10d., against £2650 in the previous year; thus the revenue is assisted to that extent. Compared with gas, the cost of the public electric lighting would appear to be £1700 more. Comparing the working profit for the past two years, the accounts show an improvement—£5601 against £3981. But the working profit was not large enough to meet interest and sinking fund charges, bad debts, &c. Last year those charges were £7550. Deducting from this sum the working profit, we have the loss above alluded to. The already large capital was increased just over £20,000 during the year—the total now standing at £123,405. On

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this account, nearly £15,000 is overcharged, and presumably has been borrowed from the bank to the advantage of the undertaking, for the loss would probably have been greater if the proportion of interest and sinking fund had to be provided, instead of interest only. Two curious items need explanation. Expenditure on public lamps and repairs was given as £670 1s. 9d., and the *per contra* revenue for the same as £661 2s. 11d. Why should not the sums be identical? Then, again, the Corporation's Year Book gives the charge for 104 arc lamps as £3737, while the present report places the total at £3696 11s. 10d."

CONSERVATION OF KENT WATER.

At the Cannon Street Hotel, last Wednesday, a meeting of land and mill owners in Kent was held for the purpose of discussing the advisability of taking some action to protect the water supply of Kent from being used for Metropolitan purposes. The gathering was convened by Messrs. Joynson and Beadle, who pointed out that certain streams and wells in Kent were doomed to extinction, and others seriously threatened, in consequence of the pumping operations of one of the Metropolitan Water Companies. Matters would not be remedied by the passing of the Government Water Bill, unless there was some modification in one of the clauses to prevent further depletion.

Mr. R. B. Berens presided, and in the course of a few introductory remarks expressed the hope that the meeting would be able to come to a decision, so as to prevent them being defrauded of their water.

Mr. Joynson pointed out that it was stated in evidence given before the Royal Commission in 1893 that the average pumping of the Kent Water Company in 1891 was 13,534,000 gallons per diem. It was estimated that the existing wells could yield 21 million gallons, and that by additional wells a further 7 million gallons could be obtained. The estimated quantity would then be 28 millions, against 13½ millions pumped in 1891. Some of the Local Authorities were working in unison to oppose the London Water Purchase Bill and the London Water Bill, in the hope that greater quantities of water than those now being abstracted from the county for the benefit of London would be prevented. He was anxious to know if they could form an Association to oppose the passing of either of these Bills, or try and get the County Council to take action whereby their interests might be protected.

Mr. Beadle also made a statement showing how the supply of water was diminishing, chiefly owing to the sinking of wells by the Kent Water Company.

Lord Avebury said that throughout Kent this was a matter of great importance, and divided itself into the question of quantity and price. There was undoubtedly a great diminution in the quantity of water, and the springs were never lower than they were at the present time. He did not intend to discuss whether this was owing to the slightness of the rainfall or to the increased demand for water. There had been an enormous amount of building going on, and there was likely to be a great deal more in the future. Under these circumstances, it was necessary that they should make an effort to husband their resources for use in their own locality. He did not altogether blame the Kent Water Company, because it was their business to supply water; but he should like to complain that some of the Local Authorities were compelling the people in the higher districts to take water from the Company, which they might very well obtain through the rainfall. If they were called upon to supply West Kent and the less important districts of London, they would soon find themselves worse off than ever. He thought they might fairly claim from the Government and the House of Commons that they should be allowed to use the Kent water for Kent people. With regard to price, the Company paid 12½ per cent. dividend; 10 per cent. being the maximum, and the other 2½ per cent. going to make up back dividends below the maximum. In a short time the right to pay these arrears would expire, and the consumers would get water 25 per cent. cheaper than at present. If the whole of the water in West Kent was to be handed over to 65 amateurs, he should not have much hope of getting the 25 per cent. reduction. He moved—"That, in the opinion of this meeting, the interests of Kent would be best served by the county being treated separately; and that as, under existing circumstances, the time is rapidly approaching when the Kent Company would necessarily reduce the price of water, the best plan would be that one or more Directors should be added to the Board of the Company by the representatives of the Kent ratepayers and landowners and occupiers to protect their interests."

Mr. Hamilton Fox seconded the motion, which was carried.

It was then decided that a working Committee of manufacturers, landowners, and millowners should be formed, with a view to establishing an Association for the purpose of protecting their interests in regard to wells, springs, &c.

The meeting then terminated.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Another event has come and gone in the shape of the spring meeting of the Waverley Association of Gas Managers. The Waverley meetings are usually small and pleasant gatherings; the members sitting round a table bearing good things for their free use. This arrangement was departed from on the present occasion; but the hope was privately expressed that it would be restored. Some who attended had been travelling for five hours, only arriving at the hour of meeting; and in their case a little refreshment would have been acceptable. Coming in its turn, the place of meeting was Kelso, where the President (Mr. A. C. Young, now of Arbroath) was stationed when he was elected. Mr. Young duly came to the meeting and zealously and acceptably fulfilled the duties of his office. Considering that the first of all Gas Managers' Associations was inaugurated in Kelso, I was prepared to hear a good deal said upon the subject; but there was not. The only allusion I heard to it was made by Mr. A. Bell, sen., of Dalkeith, in proposing the toast, after dinner, of the Kelso Gas Company. The

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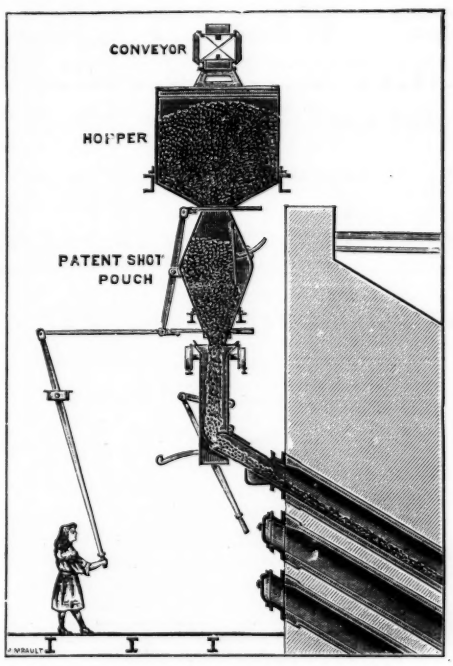

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time was short—the meeting lasted only three-quarters of an hour—and there was much to talk about, of more interest than recounting deeds of old. The members, as a rule, discuss matters appropriate to their station. This idea was not departed from on Thursday. Rather it was more pronounced than usual, the chief reason for which is to be found in the excellent lead which the President gave in his address. Instead of going to the farthest corners of the land to find something novel to discourse upon, he chose a subject which the members had but to look out of the window to see instanced, in the public lamps upon the street. It stands to reason that people can make more sensible remarks upon what they understand than upon what they do not; and this was the experience at Kelso. Too much adherence to a system of detailing the routine of every-day work would, it is true, prove monotonous and uninteresting; but with a careful selection of subjects, there is little fear of the audience wearying, even of homely topics. The remarks of the President upon public lighting, of Mr. O'Connor upon high-pressure methods of illumination, and of Mr. L. Bell upon his successful endeavours to introduce incandescent gas lighting into the wool mills of Innerleithen, were such as any audience would have listened to with attention. The only note of regret which I would venture to express in connection with the meetings of the Waverley Association is that there are some whose names are on the roll but are never present. They assuredly miss much which would be of benefit to them; and they miss, as well, the opportunity of contributing to the proceedings subject-matter which would prove useful to others—the greater privilege of the two. It would be a pity if I were to close this reference to the meeting without a few words regarding the excursion. In itself it was a delight, in respect that the places on view were exquisite as pieces of scenery. It was more so in the matter of weather, which was an uninterrupted blaze of sunshine the whole day. But the crowning delight of all was the courteous treatment of the party by the Directors of the Kelso Gas Company. They themselves attended, and were unstintedly solicitous for the comfort and enjoyment of all. The feeling inspired by their action is that the Manager who serves them must lead a happy life; and this is, again, qualified by the reflection that their bearing may, and probably does, find its root in the excellent services they have received from former managers.

An inquiry was held at the Board of Trade offices, before Mr. Pelham, last Tuesday, into the Provisional Order promoted by the Bothwell and Uddingston Gas Company, Limited, of which Mr. L. Hislop is the Engineer and Manager. There was to have been opposition to the Order on behalf of the Bellshill Gas Company and of the Bothwell Parish Council; but the former withdrew, and the latter was dealt with without any evidence being offered. The Gas Company originally objected on the ground that the area proposed to be included in the district of supply could be more easily served from the Bellshill Gas Works than by the promoters. The opposition of the Parish Council was based on the fallacious notion that what was proposed by the promoters was the creation of a monopoly, and that the Legislature ought not to sanction any monopoly except to a public body. Short work was made of this argument. The objectors were informed, in effect, that Parliament was continually granting monopolies, and that if they objected to this being done they would require to get Parliament to reverse the existing policy. It is almost needless to say that the Parish Council did not feel themselves justified in undertaking a task of such magnitude. Their opposition collapsed; and the Order is to be reported upon favourably to Parliament, which means that it will pass without further opposition. By the Order, the Company propose to raise their capital from £23,000 to £40,000—the large increase of £17,000 being taken with a view to meeting the continuous growth of the district without the necessity of further applications to Parliament. I understand that power has been taken to reduce the illuminating power to 15 candles; and my belief was that this was the first occasion upon which so low a standard had been allowed in Scotland. On perusing the Parliamentary Returns, however, I find there are 25 places in Scotland where the standard is as low as 14 candles; but in none of these is the gas supplied so low as 20 candles. The difference between Bothwell and Uddingston and those other places where a low standard is already allowed will most probably be found to be that in the case of this Company the power to reduce will be exercised to a greater extent than in the other instances. The initial price of gas in Bothwell and Uddingston is at present 2s. 11d., and under the Order it is to be 3s. 6d. per 1000 cubic feet. The dividends are to be at the rate of 10 per cent. upon the original capital, and of 7 per cent. upon the new capital. The sliding scale will apply both ways; the dividend being affected ¼ per cent. for every penny of charge upon the initial price. By obtaining this Provisional Order, the Company secure a better footing in the district; and there can only be one opinion as to the wisdom of the policy of the Directors. The benefit of their timely action will be reaped, it may be, many years hence.

The outlook with reference to the water supply of Edinburgh during the remainder of this year is more gloomy than ever. Throughout the past fortnight the weather was exceedingly dry, with the result that there was a decrease in the quantity of water in the reservoirs, during that time, of nearly 2½ million gallons. The total storage is less than it was at the corresponding date of last year by a fortnight's supply. The deficiency in the rain supply is most striking. In addition to this, the progress of the works for the bringing in of the Talla water is provokingly slow. The Contractor says he cannot get men—a statement upon which the Trustees are not disposed to place much reliance. In their view, there are portions of the work which do not conform to the contract; and there is talk of litigation or arbitration between the Trustees and the principal Contractor (Mr. John Best). There has been a meeting of the Trust this week, at which the minutes of the Works Committee, which were submitted, dealing with all the matters relating to the contracts, extended to 39 pages of printed matter. There was a discussion upon whether the Trust should go into a consideration of the minutes in private, or should send them back to the Committee for further consideration. The latter course was adopted.

The Town Council of Kilsyth let the contracts last Monday for the bringing in of an additional supply of water to the burgh. A reservoir to contain about 30 million gallons is to be constructed at Corrie, by Mr. James Banter, at a cost of £7150.

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SALTLEY WORKS, BIRMINGHAM	2,000,000	ROCHESTER	500,000
COLCHESTER	300,000	KINGSTON, ONT.	300,000
BIRKENHEAD	2,250,000	CRYSTAL PALACE DISTRICT	2,000,000
SWINDON (New Swindon Gas Co.)	120,000	DULUTH, MINN.	300,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	CATERHAM	150,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	LEICESTER	2,000,000
HALIFAX	1,000,000	ENSCHEDE (HOLLAND)	150,000
TORONTO	250,000	BUENOS AYRES (RIVER PLATE CO.)	700,000
OTTAWA	250,000	BURNLEY	1,500,000
LINDSAY (Remodelled)	125,000	KINGSTON-ON-THAMES	1,750,000
MONTREAL	500,000	ACCRINGTON	500,000
TORONTO (Second Contract; Remodelled)	2,000,000	TONBRIDGE	300,000
BELLEVILLE	250,000	STRETFORD	500,000
OTTAWA (Second Contract)	250,000	OLDBURY	300,000
BRANTFORD (Remodelled)	200,000	TODMORDEN	500,000
ST. CATHERINES (Remodelled)	250,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
KINGSTON, PA.	125,000	YORK (Second Contract)	750,000
PETERBOROUGH, ONT.	250,000	ROCHESTER (Second Contract)	500,000
WILKESBARRE, PA.	750,000	NEWPORT (MON.)	250,000
ST. CATHERINES (Second Contract)	250,000	TOKIO, JAPAN	1,000,000
BUFFALO, N.Y.	2,000,000	PERNAMBUCO (Brazil)	125,000
WINNIPEG, MAN.	500,000		

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CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *April* 12.

Sulphate of Ammonia.

The market opened quietly; but the publication of the March exports, showing an increase for January-March of nearly 7000 tons over January-March, 1901, brought out fresh interest on the part of speculators who have April "shorts" to cover, and everything offering for prompt and near delivery has been picked up at full prices. The closing quotations are £12 to £12 1s. 3d. per ton f.o.b. Hull, Liverpool, and Leith. Direct buyers have been less in evidence, for, although there has been fair inquiry, the fact that near months are being offered speculatively at a discount on prompt prices has had a deterrent influence upon direct prompt buying. Home demand has again been satisfactory, though it is now on the decline. The forward position has been rather quiet; but makers are very firm, and near the close £11 10s. per ton f.o.b. Leith, is reported to have been paid for May-December delivery.

Nitrate of Soda.

For prompt delivery, nitrate of soda is in good demand, and sellers have been able to advance their prices for ordinary and fine qualities to 10s. 7½d. and 10s. 9d. per cwt., respectively.

LONDON, *April* 12.

Tar Products.

The market continues quiet all round, the only exception being pitch, which is still very firm, with a tendency towards higher prices, especially for early delivery. A considerable business has recently been arranged in South Wales for delivery this year, and up to the end of June, 1903. It seems as if prices will be maintained for some time to come, although, of course, the question of freight will have considerable effect on the market as regards London. Benzol remains in the same position. There is no business doing, and prices are unchanged. Crude carbolic is decidedly easier. Business has been done in 60's at 1s. 11d., and in 50's at 1s. 5d.; but consumers do not seem anxious to purchase for prompt delivery even at these prices, and decline to consider business forward except at a reduction. Crystals are very quiet. Some English makers have sold 39-40's at 6d. per lb.; but even this low price does not tempt consumers to purchase. Solvent and toluol are both neglected; and it is almost impossible to fix their value for early delivery, as there is no business doing.

Average prices during the week are: Tar, 15s. to 20s. Pitch, London, 42s. to 42s. 6d.; east coast, 40s.; west coast, 36s. 6d. to 37s. 6d. Benzol, 90 per cent., 8¾d.; 50-90 per cent., 7½d. Toluol, 9d. Crude naphtha, 3¾d.; solvent naphtha, 10d.; heavy naphtha, 9d. to 10d. Creosote, London, 1⅜d.; North, ⅞d. to 1d. Heavy oils, 1⅛d. to 2d. Carbolic acid, 60 per cent., 1s. 11d. Naphthalene, 35s. to 45s.; salts, 21s. 6d. to 25s. Anthracene, "A," 1½d. to 1¾d.; "B," 1d. nominal.

Sulphate of Ammonia.

The market is very much stronger; and there is more demand for prompt and forward delivery. The Gaslight and Coke Company are no longer sellers for April, but would accept £11 17s. 6d. for May, and £11 12s. 6d. for June-September. In Leith, the market is firm. There is a good demand for prompt; and £12 is being paid. With regard to forward delivery, business is reported up to the end of the present year, but at considerably lower prices than for April-May shipment. Hull is steady. Sales have been made at £11 17s. 6d. for prompt; but £11 15s. has been accepted for April-June. As regards Liverpool, the demand has also improved, although there is not quite such a good demand for forward delivery as prevails at Leith and in London. The general tone of the market has much improved in the past week; and the outlook forward may be considered as decidedly favourable.

COAL TRADE REPORTS.

Lancashire Coal Trade.

The position in the coal trade, although steady for the time being—partly as a result of the restriction of output during the Easter holidays, and the colder weather keeping up an extra demand for house-fire qualities—is unmistakably drifting towards lower prices. One or two large gas-coal contracts will shortly come upon the market; and the London and North-Western Railway Company, whose contracts for locomotive fuel are an important item in the Lancashire trade, and largely influence prices for the lower qualities of round coal, have opened negotiations with several collieries for next year's supplies. A special meeting of Lancashire coalowners has been held during the past week, to consider what course of action they shall take with regard to prices for locomotive fuel and gas coal; but nothing definite has so far been decided—the meeting adjourning for a fortnight in the expectation that in the meantime there will be further developments in this important section of the trade, which will better enable them to come to a decision than the few isolated inquiries just now in hand. So far as the attitude of Lancashire coalowners are concerned, it remains much the same as was reported a short time back. It is generally admitted that some giving way on last year's contract rates will be necessary; but in a great many cases they do not talk of conceding more than 6d., and at the very outside 1s., per ton upon the prices that were obtained in 1901. The course which prices may take will, however, be very largely influenced by the attitude of collieries in outside districts. Last year, Derbyshire competed very keenly for both gas and locomotive fuel contracts; and this will probably be the case again. So that it is too early as yet to form any definite opinion as to what the actual basis of contract prices may be. House fire qualities of round coal are still moving off fairly well, and collieries are disposing of their output; so that, with no accumulation of stocks, and pits still working full time, there is no present necessity for reducing prices, which remain firm at 15s. to 15s. 6d. per ton for best Wigan Arley, 13s. to 13s. 6d. for Pemberton four feet and seconds Arley, and 11s. to 11s. 6d. for common house coal, at the pit. Common round coals are gradually becoming still more plentiful, the

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inland demand for steam and forge purposes being not more than moderate; while shipping business is quiet. At the pit, 8s. 6d. to 9s. may be taken as average figures for ordinary Lancashire steam and forge coals, on inland sales, with steam coals offering at 10s. to 10s. 6d. delivered at the Mersey ports. Engine fuel is steady, so far as the better qualities are concerned—these meeting with a ready sale, and Lancashire collieries have no difficulty in maintaining prices on the basis of about 6s. 6d. to 7s. per ton at the pit. Common sorts, however, have to face a very keen competition from outside districts; and with plentiful supplies on the market, prices have frequently to be cut very low. The average pit quotations in Lancashire remain about 4s. 6d. to 5s. per ton, with Derbyshire slack obtainable at from 2s. 6d. to 3s. 6d. at the pit. Coke continues in good request, with prices steady at about 22s. to 24s. for best Lancashire foundry sorts, 13s. to 14s. for best washed furnace cokes, 13s. 6d. for Yorkshire washed furnace cokes, and 11s. 3d. to 11s. 6d. for common sorts delivered at the ovens.

Northern Coal Trade.

There is now, with a lessened inquiry for coal for local use, an increased demand for export, which must be expected to grow as the Baltic ports are opened. Best Northumbrian steam coals are from 11s. to 11s. 3d. per ton f.o.b., second-class steams are 9s. 9d. to 10s., and steam smalls are 5s. to 5s. 6d. In the gas coal trade, there is a lessened demand for home use; but rather more is being sold for export. The current prices vary greatly—from 8s. 3d. to 9s. 6d. per ton f.o.b., according to quality. More of the contracts for the Metropolitan gas supply have been entered into. Generally speaking, the prices are from 8s. 9d. to 9s. per ton f.o.b.; but while one or two lots have been sold at below these figures, there are, it is believed, a few sales at, or nearly at, 9s. 1½d. per ton f.o.b. It is, however, thought that the average price will be very slightly below that of the past year. The coke trade is steady. Best Durham coke is from 17s. to 17s. 3d. per ton f.o.b.; blast-furnace coke is 15s. to 15s. 3d. per ton on Teesside. Gas coke is a little steadier, the production being less; but there is no alteration in the prices quoted generally.

Scotch Coal Trade.

Trade is not very bright, one of the sure indications of which is the outcry about the scarcity of waggons, which always comes when they are held up full at the collieries. Splint is almost a drug in the market; there being broken time at many of the collieries on account of want of orders. The best demand is for treble and double nuts and first class dross, both for home consumption and for export. The prices quoted are: Main 8s. 3d. to 8s. 6d. per ton f.o.b. Glasgow, ell 9s. 6d. to 10s. 6d., and splint 9s. 9d. to 10s. (easy). The shipments for the week amounted to 195,734 tons—a decrease of 13,426 tons upon the preceding week, but an increase of 32,755 tons upon the corresponding week of last year. For the year to date, the total shipments have been 2,368,356 tons—showing an increase of no less than 264,281 tons upon the same period of last year.

Suffocation by Gas.—A case of suffocation by gas, which terminated fatally, occurred in Edinburgh on Thursday last. A peculiarity of the case was that it was an inspector of gas-meters who discovered the accident. He called at the Evangelical Union Church, in Dalry Road, for the purpose of reading the meter, and found James Richardson, the church officer, sitting in a dying condition upon a chair in a side room. The room was filled with gas, which was coming from a bunsen burner upon a table. The inspector removed the man from the room, and procured a doctor, who endeavoured to restore him to consciousness; but after an hour-and-a-half he had to pronounce life to be extinct.

New Water Supply for Bilbao.—The scheme for impounding and conveying water from the River Cerneja, devised by Señor D. L. Vasconi and Señor D. J. Bores, has been published. According to some particulars in the "Revista Minera," it is on an extensive scale as regards the utilization of the discharge of water, which attains 1000 litres (220 gallons) per second—250 litres for the Bilbao public service, and 750 litres for motive power at various points along the line of the conduit. The water is collected from the streams of Cerneja and Ventorillo at Los Tornos, a Cantabrica-Mediterranean watershed. The aqueduct starts at a point about 840 yards above sea level; the altitude being sufficient to enable it to cross, without tunnelling, the watershed of the Ebro and Cadagua. Its length will be about 44 miles to convey the water by Valmaseda to Bilbao, or to any place designated by the Municipality, at an altitude of 450 feet. There are three heads of water along the conduit. The cost is estimated at about £600,000; and the time required for the construction of the works is five years. The estimated rates per 220 gallons are 2½d. for domestic purposes, 1½d. for industrial uses, and rather less than 1d. for irrigation, road watering, &c. The quality of the water supplied is reported to be excellent.

Opening of New Water-Works at Rainham.—Last Wednesday week, the new works of the Rainham Water Company at White Hill were opened by Mrs. Whayman (wife of Mr. G. Whayman, the Chairman), by whom the facts which prompted the Company's enterprise were related. He said that during the summers of 1897 and 1898 they were very short of water. The Directors of the old and of the present Company, therefore, decided that they must do something to prevent scarcity in the future. They were at that time under an agreement with the Sittingbourne Council to take all their water from them; but the Council kindly released them, and they set to work at once to carry out their ideas. With the aid of Mr. Grant, the Company, in the autumn of 1898, arranged their plans; and early in 1899 tenders were accepted for the different works. There were difficulties in boring; but perseverance was ultimately rewarded, and at a depth of about 900 feet, they found what it was hoped would prove a good and lasting supply of very pure water. There were two sets of pumps, each capable of raising 12,000 gallons per hour; and, though they had only one boiler and one engine, they had made room for two. The reservoirs would hold 400,000 gallons; and the Company hoped to keep them full, so that they would always have five days' supply in hand.

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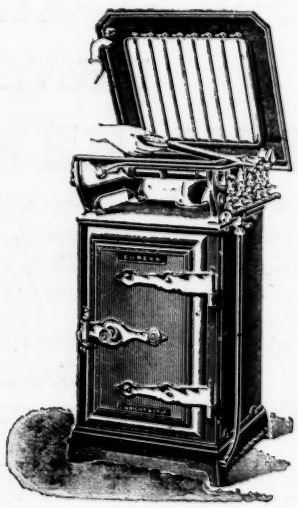


It was No. 1,

And is so still.

The New Holder at Portsea.—In the paragraph on this subject which appeared in the "JOURNAL" last week (p. 918), the dimensions were incorrectly stated, owing to an accidental transposition of words. The holder, which is a four-lift one, is 182 ft. 6 in. diameter, and each lift is 32 feet deep. The diameter, of course, is that of the outer lift.

Bridgwater Water Supply.—Last Wednesday, Mr. E. A. Sandford Fawcett, one of the Local Government Board Inspectors, conducted an inquiry into an application by the Bridgwater Corporation for sanction to borrow £7000 for works of water supply, including the construction of works in the parishes of Bridgwater Without, Durleigh, and Wembdon, and for a waste-prevention scheme for the borough. The Deputy Town Clerk (Mr. P. O. H. Reed) appeared in support of the application, to which there was no opposition.

River Plate Gas Company, Limited.—The report of the Directors of this Company for the year 1901 states that the profit shown by the revenue account is £87,933. After payment of all fixed charges, making the usual allowance for bad and doubtful debts, and providing for upkeep of the works, mains, &c., there remains to be dealt with the sum of £77,371. The interim dividend paid in October absorbed £25,532, and the Directors now propose to write £2000 off the discount on the issue of debenture stock, and to pay a final dividend for the year at the rate of 8s. per share, making 7 per cent., tax free—£15,797 being carried forward.

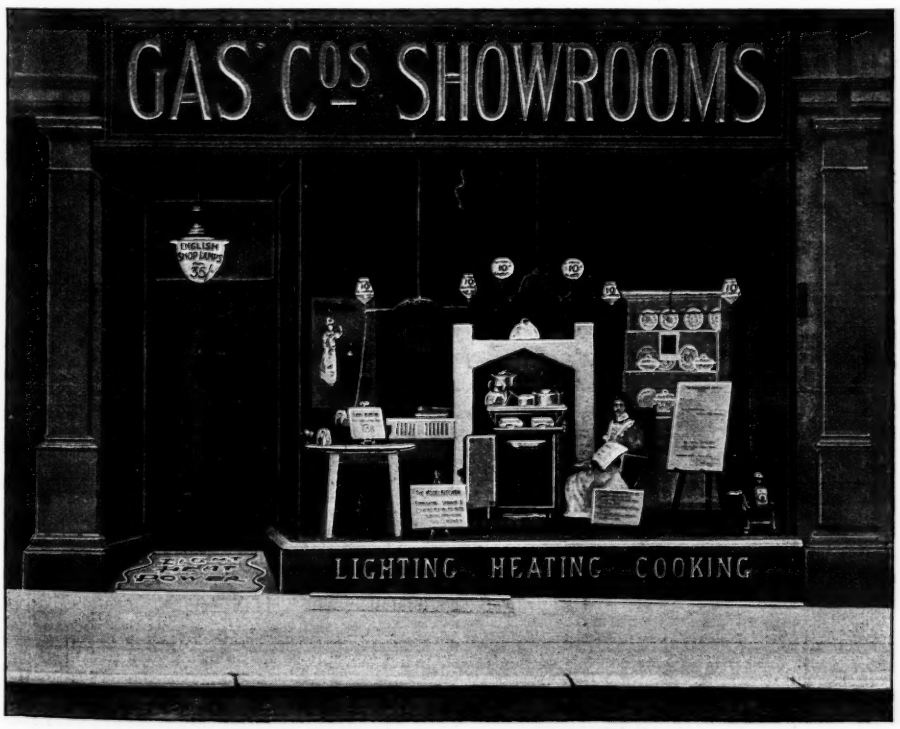
Swansea Gas Company.—The report of the Directors of this Company for the half year ended Dec. 31 last, which has been adopted by the shareholders, stated that the consumption and sale of gas was steadily increasing, and that notwithstanding the reduction of 4d. per 1000 cubic feet made in the price last July, the rental to private consumers had increased by £1069, while the total consumption showed an increase of 13¼ per cent. as compared with the corresponding six months of 1900. The profit earned enabled the Directors to recommend the declaration of the authorized statutory dividend at the rate of 5 per cent. per annum on the consolidated and new ordinary stock; and after providing for debenture interest and placing sums to various depreciation funds, to carry forward a balance of £864.

Consolidated Water-Works Company of Rosario, Limited.—The report of the Directors of this Company for the year 1901 states that the gross revenue, after making due provision for bad and doubtful debts, amounted to £42,873, and the working expenses to £18,200; leaving a balance of £24,673. After providing for debenture stock and other interest and income-tax, writing off the balance of preliminary expenses, and placing £1000 to the depreciation fund and £2600 to the reserve fund, there remains an available balance of £12,728 at the credit of the net revenue account. The Directors recommend a further dividend on the preference shares, making the full preference dividend of 6 per cent. for the year; carrying £4382 to the credit of the ordinary share dividend account. This amount makes a total at the credit of this account of £6161, out of which the Directors recommend a dividend of 4 per cent. on the ordinary shares; leaving £1961 to be carried forward.

Consett and Weardale Water Companies' Amalgamation.—Special meetings have been held of the shareholders in the Consett Water Company and the Weardale and Shildon Water Company, for the purpose of considering the provisional agreement entered into by the Directors for the amalgamation of the concerns. The basis of the arrangement has already been given in the "JOURNAL" (*ante*, p. 663); and it is stated that the area of the operations of the two Companies comprises about one-half of the county of Durham. The proposal was unanimously approved by the shareholders of both Companies.

The Lead Poisoning at Shelf.—In further reference to this matter, which was alluded to in the "JOURNAL" last week (p. 911), we learn that samples of water which were taken by the Bradford Corporation for the satisfaction of the Shelf District Council, as suggested, and analyzed by Mr. E. W. Richardson, the City Analyst, show results favourable to the contention of the Corporation as to the general excellence of their water supply; the water being characterized as "remarkably pure and soft." Mr. James Watson, the Water Engineer, states that hundreds of samples of the Bradford water have been analyzed from time to time by Professor Dewar, Dr. Hime, and others, and not one of them has shown a trace of lead. Mr. Watson is of opinion that lead pipes are safe enough if not too soft in composition; and he says that the same water as is supplied to Shelf is received without ill effects by other districts.

Dunstable Gas and Water Company.—At the recent annual meeting of the Dunstable Gas and Water Company, the Directors reported a balance of £1152 18s. 3d. to the credit of the profit and loss account of the gas undertaking, from which they advised the payment of a dividend at the rate of 6¼ per cent. on the "A" shares and 3⅛ per cent. on the "B" shares, free of income-tax, which would absorb £687 10s.; and a balance standing to the credit of the profit and loss account of the water undertaking of £1161 19s. 3d., the declaration of a dividend at the rate of 5 per cent., also free of income-tax, which would absorb £457 6s. 8d. The report was adopted. In moving a vote of thanks to the officials, the Chairman (Mr. B. Bennett) said the meeting would be glad to hear what their Engineer (Mr. A. F. Phillips) had to say about the electric light. Mr. Phillips replied that he had never had the slightest fear of the electric light coming to Dunstable. It was not possible even with the old gas-burners, but with incandescent ones he regarded it as quite impossible. Supposing they wished to have a light of (say) 1000-candle power, they could obtain from incandescent gas burners 20-candle power for every cubic foot of gas consumed. Consequently, 1000-candle power could be produced with 50 cubic feet of gas, or at a cost of 2½d. But if they wished to produce the same light by electricity, taking four watts per candle power, they would require 4000 watts of current, or four Board of Trade units, and at 6d. a unit the cost would be 2s. This was a fair price and a fair comparison; and he thought it was quite conclusive. It was, in fact, at Dunstable, in the matter of gas or electricity for street lighting, a case of 2½d. or 2s. for each 1000-candle power of light required. The shareholders of Dunstable Gas Company need not have the slightest fear about competition from electricity.



"GAS IN THE HOME" SERIES.

"Model Kitchen" Exhibit, Plymouth.

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Harwich Gas-Works Extension.—As the result of the local inquiry held by Mr. Ingram J. Walker (*ante*, p. 841), the Board of Trade have decided to grant the application made to them by the Harwich Gas Company for authority to erect a gasholder on the land on the Bathside Estate, at Harwich.

Water-Works for Lesswood.—Last Wednesday, Colonel Langton Coke, M.Inst.C.E., held an inquiry, on behalf of the Local Government Board, regarding the application of the Holywell Rural District Council to borrow £1500 for the purpose of establishing water-works for the township of Lesswood, near Mold. Mr. P. Harding Roberts (Clerk to the Holywell District Council) said the estimated cost of the proposed works was £1555, and the Rural District Council intended to apply for a loan of £1500. The source of the supply selected was the Ffynnon Deg spring, which yielded 36,500 gallons per day; and it was proposed to construct close to the spring a reservoir to hold 100,000 gallons. There was no opposition to the application.

Central Gas Company (Eugene Lebon et Cie.).—At the annual general meeting of this Company, held in Paris on the 27th ult., it was reported that the gross revenue from the sale of gas and electricity in the year ending Dec. 31 last was 13,548,413 frs., compared with 12,672,468 frs. in the preceding year; being an increase of 875,945 frs. (£35,038). The profits amounted to 6,557,193 frs., against 6,372,318 frs. —an increase of 184,675 frs. (£7387). The general expenses for the year were 4,646,726 frs., against 4,636,004 frs.—a difference of 10,722 frs. (£429); leaving a balance of 1,910,467 frs. (£76,419). Out of this, 252,093 frs. went to the General Managers (MM. Eugene Lebon et Cie.), and 47,762 frs. to the Board of Supervision and to the Committees; leaving for disposal 1,610,611 frs. (£64,424). The dividend paid was 60 frs. per share, which absorbed 1,560,000 frs.; and the remainder (50,611 frs.) was added to the contingent fund.

The Directors of the River Plate Gas Company, Limited, recommend a final dividend for the year ended Dec. 31 last of 8s. per share, tax free, making altogether 7 per cent. for the year; carrying forward £15,796.

At the last monthly meeting of the Halifax Rural District Council, it was announced that the negotiations for the purchase of the Clifton Water Company's undertaking had been completed; the sum agreed upon being £6000.

The Arbroath Corporation have placed with Messrs. R. Dempster and Sons, Limited, of Elland, the contract for regenerators, consisting of settings of eights; and the retort mountings for same with Messrs. Balfour and Co., of Leven.

The Richmond Gas Stove and Meter Company, Limited, have secured an important contract for Holyrood Palace, Edinburgh (His Majesty's palace in Scotland). It comprises two Richmond cooking ranges, one treble range, and one hot closet and carving-table.

Messrs. R. & A. Main, Limited, have just concluded highly successful gas exhibitions (combined with free cookery lectures) at the following places: Brechin and Darvel, with lectures by Miss E. M. Dods; Coatbridge, with lectures by Mrs. Young; Rock Ferry (Birkenhead), Darwen, and Bishop Auckland, with lectures by Mrs. H. C. Gray; Selkirk, and Hoddlesden (Darwen), with lectures by Miss M. Baines; Alva, with lectures by Miss A. Richards; and Fraserburgh, with lectures by Miss S. Y. Young. The firm have also held a most interesting exhibition at Hawick, in combination with a display of high-pressure incandescent gas lighting by Messrs. Moffat's, Limited, and the James Keith and Blackman Company, Limited. A Crossley gas-engine was shown in operation; and lectures were delivered by Miss Dods.

The tender of Messrs. W. C. Holmes and Co. for the supply of a rotary washer for the Loughborough Gas-Works has been accepted.

In the Phœnix Rooms, Lancaster, last week, Messrs. Wilsons and Mathiesons, Limited, held an exhibition of their gas-stoves, under the auspices of the Gas Committee of the Corporation. Lectures on cookery were delivered by Mrs. C. F. Pitcher. A gas-stove exhibition was held in the Bethesda School-Room, St. George's, Bristol, last week. The stoves were those of the Davis Gas-Stove Company, Limited, and there was a large assortment of them. Cookery lectures were given by Miss A. C. Wilkinson twice daily.

Last Wednesday, Mr. Nichol Jenkin, whose name is known in connection with a movement for the formation of an association to promote and maintain between employers and employees a feeling of common interest, by the agency of which it is hoped that strikes will become matters of rare occurrence, delivered an address at a special meeting of the Manchester and Salford Trades Council. He simply asked for a vote of sympathy with the movement from the assembled delegates. The movement was yet in an embryonic state, but when sufficient support had been guaranteed, the question of finance would be brought forward. There was no idea of hampering Trade Unions in a strike if it was felt that, in the circumstances, it was absolutely necessary. The sole aim was to secure reforms by peaceful means. A unanimous vote of sympathy with the movement was passed.

Messrs. Joseph Taylor and Co., of Bolton, have received an order from the Nelson Corporation (for their new sulphate of ammonia works at Brierfield) for the delivery and erection complete of one of their most recent makes of solid plate lead combination saturators, with double detachable ammonia and acid pipes, &c., and fitted with a 1¾-inch plate lead well, with outlet valve. It is to be timber lagged, including a stout pitch pine cradle. The saturator is so constructed as to act at will for self-emptying, steam discharging, or hand fishing. The firm are to supply the lead lining required for the new sulphate stores, as well as a mother liquor ejector, piping, &c. Messrs. Taylor and Co. have also received an order from the Burnley Corporation for a 1½-inch plate lead saturator, with 1¾ inch bottom and well, fitted for steam discharging. The saturator comprises all the recent improvements, and is exactly similar to one supplied to the new works of the Blackburn Corporation.

Reference has already been made in the "JOURNAL" to the profit-sharing scheme of Messrs. Willey and Co. It provides that, after making a due return to capital and providing a reserve, 25 per cent of the clear profits shall be divided among the employees who have been in the firm a given time. Half of the amount is carried to the credit of the men on deposit accounts, and the other half is payable in cash. The sum available for apportionment at the end of the first year's working of the scheme was £1051; and last Thursday evening the distribution was made at a meeting of the men at the end of the day's work. Mr. Willey, in the course of his address, remarked that the experiment he had started was one he hoped to maintain, but that its continuation depended upon the individual efforts of the employees, who promoted economy in bringing about the prosperity of the works. He realized that his own responsibility was to do everything he could to advance the welfare of the workers; but he did not pretend that their share in the profits would be continued unless they honestly earned them by assisting in effecting economies. All the employees were paid fair wages; and the bonus was given to induce them to help to increase the profit upon their industry. At the close of Mr. Willey's address, several of the heads of departments expressed the appreciation of the men for the consideration shown for them in this matter; and it was pointed out that the operation of the scheme promised to bring about what would practically be an old-age pension for some of them. Distribution of the bonuses was then made amid much applause.

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No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

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